

FAROUK I UNIVERSITY BULLETIN OF THE FACULTY OF ARTS.



VOI. II. — 1944

The Bulletin of the Faculty of Arts is issued once a year at the end of every University Session. Applications for copies are to be made to the Librarian, University Library, Moharram Bay, Alexandria. Other communications regarding the Bulletin are to be addressed to the Hon. Sec. of the Editorial Board :
Dr. A. E. AFFIFI.

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ALEXANDRIAN NOTES.

The three short notes here printed were written for broadcast talks to be given in April and May 1944. They all deal with questions of Alexandrian topography and try to present in a clear and simple manner the present state of our knowledge on the topics concerned. They make no claim to be exhaustive or final, for it is to be hoped that future excavations will throw more light on all such problems. From their very nature the talks are rather more dogmatic than is desirable in purely archaeological notes. Owing to their brevity it is, of course, not possible to indicate the evidence for or against any particular statement. Nor is it possible to give literary and other references, which can be most conveniently found in Calderini's topographical dictionary. Such as they are then these notes are offered in the hope that they may be of some use in assisting non-specialists.

I. The Serapeum.

Everyone who knows Alexandria knows Pompey's Pillar, a name which is quite incorrect. It seems to have been called Pompey's Pillar by the Crusaders. The true account of its origin had been lost and they were told some fantastic story that the head of Pompey was enclosed in a cage set on the top of it. In Arabic it is called 'Amud al Sawari. The origin of this name is even more obscure and no satisfactory reason for it has yet been suggested. In reality the pillar or column was erected in the year 297 in honour of the Roman emperor Diocletian who dealt mercifully with Alexandria when it had revolted against him. The column stands on the top of a hill of rock and all around can be seen ancient ruins of various dates. That a great building once existed here on the rock round the column is obvious. Ancient Arab writers tell us that according to tradition a great palace once stood

here. Another Arab author records that about 1171 the then governor of Alexandria ordered the destruction of more than a hundred columns of granite on the site and then had the fragments transported to the harbour to build either a break-water or else some defensive work against attacks from the sea by Crusaders. Fragments of granite columns deliberately split by wedges into small pieces which have been found among the ruins seem to prove that there is some truth in this story⁽¹⁾. All about the area too are fragments of broken marble which show that any marble there was, was purposely broken up to be burnt for lime. The whole site has been dug into again and again by those in search of stones for building material. Not only have columns with their capitals and bases completely disappeared, but whole walls of solid masonry have been torn out and only the cuttings in the rock remain to show where walls, colonnades, and temples once stood. These ruins are really the ruins of ruins. It is not surprising that it is extremely difficult now to trace where colonnades and temples once stood or to unravel the plan of the construction of which fragments still survive in spite of all.

For many years it has been generally believed by archaeologists that on the flat top of this rock round Pompey's Pillar stood the great Temple of Serapis, the most famous sanctuary of ancient Alexandria. This temple illustrated the attempt of the Ptolemies to unite Egyptian and Greek civilisation and religion. Serapis is a combination of Osiris and Apis and was worshipped here with Isis his wife, their son Horus whom the Greeks called Harpocrates, Anubis the god of the lower world and other gods. Serapis was represented by the Greeks as a beneficent divine being resembling the Greek Zeus, the Roman Jupiter. The records we possess do not say clearly who founded the sanctuary. One account says it was Alexander himself. Another that Ptolemy I brought here from Sinope in the Black Sea a statue which was identified by the priests as one of Serapis. He had seen the statue in

(1) Perhaps the red granite columns at the Mosque and Fort of Kait Bey have some connection with this.

a dream. Now the excavations at the site which Mr Rowe Director of the Graeco-Roman Museum has been conducting scientifically and patiently for the last two years with the encouragement of the Director General of the Municipality have given us the name of the builder of the great Graeco-Egyptian temple and sacred enclosure which became so famous in Graeco-Roman times. Last August Mr. Rowe found under the emplacement of one of the corner stones of the enclosing wall a series of ten plaques, the foundation deposit laid down when the building was begun. The corner stones, under which the plaques were laid, were long ago taken away by those who used the site as a quarry. Fortunately they were not as thorough and scientific as Mr. Rowe and the inconspicuous hollow in the rock where the plaques were laid beneath the masonry miraculously escaped their greed. There is one plaque of gold, one of silver, one of bronze, one of faience, one of Nile mud and five of opaque glass. All are inscribed in Greek and in Egyptian hieroglyphs. They state clearly that Ptolemy III built the temple and the sacred enclosure for Serapis.

The rock where the temple stood was sometimes spoken of as an acropolis or citadel and was said to be in Rhakotis that quarter of Alexandria where a small Egyptian town had stood before Alexander founded his city. Here there was a temple of Osiris and Isis in which Ptolemy I is said to have placed the statue of Pluto from Sinope. He did not build that temple for it already existed and its existence is proved by at least one early Ptolemaic dedicatory inscription found on the site. Whether Ptolemy II did anything to enlarge or beautify the temple we do not know, for there is no evidence either literary or archaeological. Ptolemy III as the foundation plaques now prove, built here the first great Graeco-Egyptian temple of Serapis. It was his policy we know from other inscriptions to bring together the Greeks and the Egyptians in the worship of the native gods.

He restored or built many Egyptian sanctuaries throughout the country with this very object. No doubt the building of

the Serapeum at Alexandria was part of the same policy. Recently the excavations have yielded no less than four inscriptions all mentioning dedications to Serapis. Thus there is no longer any doubt but that the area round Pompey's Pillar was the site of the famous temple of Serapis, one of the great glories of ancient Alexandria where Egyptians and Greeks both together could worship Osiris and Isis and other Egyptian gods.

What was the Serapeum like? We have accounts, necessarily incomplete, from several ancient writers. The temple we are told stood on a rocky hill and was the dominant feature of a series of buildings. A flight of one hundred steps led to the platform on the top of the hill. There the temple occupied the centre of a large rectangle. The super-human statue of the god touched the side walls with his right and his left hand. It was made of various woods and of metals. The walls of the shrine were covered with plates of gold, of silver and of bronze. There was a window ingeniously arranged so that at every season of the year the first rays of the rising sun fell on the lips of the god. The whole temple was decorated with precious stones and rare marbles. In it were dedicated many rich offerings. It, the open space round it and the porticoes and exedras were adorned with statues and with works of art of all kinds. Round it were chambers where priests and devotees could live. Underneath were secret rooms for mysteries of the worship of the gods. Another account adds that the whole area was square. The hundred steps led into a vestibule closed by a grille and four columns adorned the entrance. The temple was enclosed by porticoes attached to which were bookcases. There those who wished to read could always find books ready to hand. The roofs were covered with gold (probably really gilded bronze). At all events the tops of the columns were covered with gilt bronze. In the centre was a great column. Before the centre of the court was a building with a hundred doors each bearing the name of some ancient divinity. There were also two obelisks and a fountain and statues of the twelve

creators of the building. In addition to the library the temple seems to have possessed also a Nilometer for measuring the rise of the Nile, a feature found in other Egyptian temples of Ptolemaic date, for instance that of Edfu. The references to books and the library refer to the circumstance that after the foundation of the great library in the Mouseion a branch library was formed. This, which held nearly 50,000 books, was known as the daughter library and kept in the Serapeum. Its formation was presumably due to Ptolemy III the builder of the great Serapeum, but Cleopatra probably helped it especially after the damage done to the mother library in Caesar's Alexandrian War.

Though the Serapeum must have suffered during the various riots and rebellions that took place under the Roman empire it and its contents remained more or less intact till 391. In that year religious riots broke out in Alexandria. The Serapeum was the last stronghold of the pagans who fortified themselves in the temple and its enclosure. The sanctuary was stormed by the Christians. The pagans were driven out, the temple was sacked, and its contents were destroyed. In this struggle the library presumably perished also. The fury of destruction can be recognised from the fact that the recent excavations have lately unearthed a block of grey granite with a Greek inscription recording the dedication of a bronze statue to Serapis. The statue has of course long since vanished and the block of granite was found shattered into many pieces by the triumphant christians eager to wipe out all traces of heathenism.

Of the glories of the temple itself the excavations have so far revealed little. The finest works of art are an Apis bull in black granite and a white marble bust of Serapis the face of which was gilded. Two sphinxes in red granite and a huge scarab have also been found. An interesting find is an altar once decorated with painted garlands and dedicated to Ptolemy II and his sister and wife Arsinoe. This is further evidence that a sanctuary existed before Ptolemy III built the great temple. All over the site there are many fragments of

fine slabs of coloured marble and broken columns and other architectural fragments of red granite. The actual position of the temple is still unknown. The site of the great flight of one hundred steps is also undetermined. It seems there was a double colonnade surrounding the whole area. The outer colonnade was Roman and the inner the original Ptolemaic colonnade. This is approached at the southeast corner by a flight of steps. On the east and apparently on the north the colonnades stood on the upper level of rock. On the south, however, excavation has uncovered the foundations of a colonnade on a lower level, at the foot of the rock. Here a row of columns formed a central walk. This has on its outside a long row of small chambers built against the outer wall of the enclosure. These may have been some of the underground chambers for the mysteries of the worship of Serapis or some of those dedicated to the hundred ancient divinities. So far the evidence of the excavations confirms the descriptions of the ancient writers. Now that they are being systematically pursued it is to be hoped that in time we may be able to obtain a more vivid picture of the Serapeum one of the greatest Graeco-Egyptian temples and the greatest in Alexandria.

II. The Tomb of Alexander.

Ancient custom decreed that the Kings of Macedonia should always be buried in Macedonia at the city of Edessa. All the royal ancestors of Alexander the Great were buried there. So when Alexander himself died at Babylon in the summer of 323 B. C. his ministers and generals who undertook to administer the empire on behalf of his unborn son made preparations to send his body back to Macedonia for burial. A sumptuous car was prepared appropriately adorned for so great a king. His body wrapped in gold and dressed with all the insignia of royalty was laid in a glass coffin. When the procession was ready to start for Macedonia conditions at the headquarters of the government and army in Asia had changed. Perdicas the chief minister was trying to hold the

vast empire together in spite of the individual ambitions of Alexander's officers. Certain generals, however, were already attempting to satisfy their own desires and to secure portions of the empire for themselves. With such ulterior motives his generals met in council and appointed themselves governors of large provinces which Alexander had subdued. Among his generals was one called Ptolemy. He was a shrewd, capable soldier and related to the royal family. He had been in Egypt with Alexander when he founded Alexandria. Ptolemy observed the richness and the advantages of the country, how easy it was to defend and that its new city Alexandria, was likely to become if wisely administered, one of the principal, if not the principal, city of the eastern Mediterranean. He therefore secured for himself the appointment as governor of Egypt. There was a Greek custom that kings and other great men who founded or re-founded cities should be buried in them in some prominent and central place. The possession of the founder's body was regarded as a great asset. It was believed that the founder's spirit from the other world would take steps to protect the city which as his foundation gave a resting place to his body and honoured his grave and memory. Ptolemy thus realised that if he could obtain possession of Alexander's body for burial in Alexandria, he would greatly strengthen his position and his prestige. Accordingly before the procession with Alexander's body was ready to set out for Macedonia the rumour began to circulate that Alexander had left instructions that he was to be buried at the Temple of Zeus Ammon in the oasis of Siwa. While he was in Egypt Alexander had visited this famous sanctuary and it was said that the god hailed him as his son. So the rumour that Alexander wished to be buried at Siwa ran around. Whether Ptolemy originated it we cannot tell, but he at any rate profited by it. Ptolemy too was in league with the officer who was placed in charge of Alexander's funeral procession. Thus in 322 B.C. when it finally started, it took the road not to Macedonia, but through Damascus to Egypt. Perdiccas the chief minister heard, but heard too late. His

efforts to stop or divert the procession were useless. The funeral car with Alexander's body had already passed into the power of Ptolemy. The body with all royal state was first taken to Memphis and there given temporary burial. Later perhaps not till the time of Ptolemy II it was placed in a golden sarcophagus and given permanent burial in his own city, Alexandria.

In Alexandria Ptolemy built a sacred enclosure as a mausoleum for Alexander on a scale of magnificence suited to his greatness. This tomb was seen in Alexandria by many people. Strabo the geographer saw it. Augustus, the first Roman emperor, visited the tomb. He wished to touch the body of the great conqueror and in doing so damaged the nose. He placed a crown on the head and scattered flowers over the body. When asked if he would like to see the bodies of the Ptolemies, Augustus scornfully refused saying he wished to see a king and not dead men. The actual body of Alexander seems to have been kept in a special vault and to have been brought out to show to such visitors. Before this however the golden sarcophagus had been taken by Ptolemy XI. The famous Cleopatra also in a moment of financial stress had taken many valuable offerings from Alexander's tomb, so the Jewish historian Josephus relates. The mad emperor Caligula is said to have worn Alexander's golden breastplate and this he may well have abstracted from the tomb. Later at the beginning of the third century the Roman emperor Septimius Severus made the tomb unapproachable. He collected all the sacred books of Egypt and placed them in it and forbade access either to it or to the books. His son Caracalla who posed as a reincarnation of both Heracles and Alexander, placed in the tomb a purple cloak, fine rings, a gorgeous military belt and various other precious offerings. This is the last recorded visit to the tomb. What happened to it thereafter we do not know, but already in the fourth century St John Chrysostom in one of his addresses asked, "Where is the body of Alexander?" Is it possible that by then knowledge of the position of the tomb had been lost? One ancient writer

says that Ptolemy IV wished to collect in one magnificent mausoleum the bodies of all his ancestors the earlier Ptolemies and the body of Alexander as well. We do not know whether he actually did so. He may have built a grand mausoleum for the Ptolemies by the side of the Tomb of Alexander. If he collected there the bodies of his ancestors, it does not necessarily follow that the original tomb of Alexander remained empty and neglected.

Where was Alexander's Tomb ? Can its site be recognised in Alexandria to-day ? This is a standing problem of Alexandrian topography. The interesting and peculiar feature is that no tradition has survived in Alexandria linked with any particular spot as the site of the tomb of the founder of the city. That the royal mausoleums of the Ptolemies which, as already stated, probably adjoined the Tomb of Alexander, should have vanished completely need cause no surprise. Such tombs would be plundered, then neglected and left open to destruction and all traces of them would soon be lost. That Alexander's Tomb should have been lost is surprising. Alexander was buried we are told in the Macedonian manner. Therefore we should expect his tomb to have resembled, in plan and construction at least, an early Ptolemaic tomb like those discovered in Alexandria at Anfushy or Mustafa. It would of course have been much larger and more magnificently decorated and surrounded by a sacred area where dedications could be made to Alexander. The tomb itself was probably underground hewn out of the rock and would have consisted of several chambers. In front of it would have been a sunken, unroofed court containing perhaps an altar where due rites could be paid to the hero. This tomb of Alexander was near or within the royal quarter towards the eastern part of the city and probably not far from the intersection of its two main streets. One of the two main streets of Alexandria was the Street of Canopus which ran from the Gate of the Sun in the east to the Gate of the Moon in the west. Since the ancient cemeteries of Alexandria are in the Chatby and Hadra areas to the east and in the Gabbari area to the west,

the ancient city must have lain between these two extremes, for the cemeteries were always outside the walls of a Greek city. The site of the old Rosetta Gate in the Arab walls probably marks the east end of the old main street which would have followed the course of the modern Avenue Fuad 1st. The Mahmudieh Canal on the west marks roughly the western limit of the ancient city. A north and south line dividing this area in two would have passed just to the west of the modern Fort of Kom El Dik. Thus we should look for the Tomb of Alexander somewhere near the intersection of Avenue Fuad 1st and the Rue Nebi Daniel, for as already stated it was the custom that the semi-divine founder of a city should be buried near its centre.

Till the middle of the sixteenth century there was in the city a small building called the Tomb of the Prophet and King Iskander. According to a traveller this stood near the church of St. Mark⁽¹⁾ which was among a mass of ruins in the centre of the town. The Coptic Church of St. Mark is close to the Rue Nebi Daniel and close also to the Mosque of Nebi Daniel. This then should be the area where we should look for the Tomb of Alexander and it is more or less in the centre of the ancient city. Some have suggested that the Prophet Daniel who came from Babylon has been confused in tradition with Alexander who was brought here to Alexandria from his deathbed at Babylon. Some believe that Alexander's Tomb lay under the Mosque of Nebi Daniel and stories have been told of vaults beneath the Mosque. The dragoman of the Russian Consulate in 1859 asserted that he had entered those vaults and had seen through a hole in a wooden door a cage made of glass. In that was a human body crowned with a golden diadem and placed on a throne. Books and papyri were scattered round it. This tale is probably pure fiction. The imaginative dragoman had probably been reading some of the ancient accounts of the Tomb of Alexander and invented the

(1) The existing mosque of Sidi Iskander is nowhere near the Church

story to please his hearers. There is no evidence of the existence of any such vaults beneath the Mosque of Nebi Daniel. Mahmud Bey Falaki, whose evidence should be considered trustworthy saw nothing of the kind. Excavations by side of the Mosque have revealed portions of an important building with a colonnade. These ruins may well have been connected with the enclosure surrounding the Tomb of Alexander or with one of the Ptolemaic mausoleums. If it is correct that Kom el Demas, said to be a variant of Kom el Dik at the western foot of which lies the Mosque of Nebi Daniel, really means "Mound of Bodies" it suggests that a mausoleum stood in the neighbourhood. As the Royal Quarter was the northeastern quarter of the city this site would have adjoined at least its southwestern angle. There is also a record of the discovery of some golden ornaments of the time of Alexander near a site called Demas, but the value of this is open to question. Nevertheless all the evidence points to the probability that the Tomb of Alexander lay somewhere near the Mosque of Nebi Daniel. If it were ever possible to excavate in that neighbourhood some indications might be found which could lead us to a closer identification of the possible location of the Tomb. The Tomb was probably underground hewn out in the rock, as already described.

Above ground there would have been perhaps a temple of Alexander with colonnades round it all within a sacred enclosure, for we know Alexander was worshipped as a god and the day of his death was kept in Alexandria as a holy day. Round the Tomb would have been the tombs and temples of the early Ptolemies at least. There was such a monument to Ptolemy I and his wife Berenice, and a similar one to Ptolemy II and his sister and wife Arsinoe. Their successors would probably have been honoured in the same manner. Connected with all these there was perhaps a tumulus or some artificial mound. Though so much is conjecture, yet let us hope that chance discovery or scientific excavation, whenever that is possible, will at last solve for us the problem of the position of the Tomb of Alexander. We know the site of Caesar's pyre.

We know the Tomb of Napoleon. May we not some day know also the Tomb of Alexander ?

III. The Library

The great library of Alexandria was the most famous library of antiquity, but it was by no means the first library ever created. Other men long before the days of the Ptolemies had formed libraries and the most famous of these was the great philosopher Aristotle. A follower of his Demetrius of Phaleron, who was philosopher, orator and politician was exiled from Athens and took refuge in Egypt about 307 B. C. He was well received by Ptolemy I Ptolemy like Alexander's other generals who had made themselves kings and had divided the empire wished to encourage learning in his new capital Alexandria. He entrusted Demetrius with the formation of a school of learning on the model of Aristotle's Lyceum at Athens. Demetrius drew up the scheme for the institution and persuaded scholars and scientists of all kinds from all over the Greek world to settle in Alexandria under Ptolemy's patronage. For their use a library was begun. The school of learning was known as the Mouseion, the *Home of the Muses* who were the patron goddesses of all learning. This is the origin of our name Museum. It was a state institution financed by the kings and afterwards by the Roman emperors. It was not a university because its main object was not teaching, but rather research. It was in fact a research institution. Since Demetrius was put to death by Ptolemy about 283 B. C. the Mouseion must have been founded earlier, probably about 290 B. C. Strabo who visited Alexandria during the reign of Augustus says that part of the palace was given to it. There the philologists, as he calls them, had a promenade for walking and exedras for sitting. There too was a great hall where they had their meals in common. In charge of all was a priest. The library was formed as part of the necessary apparatus for the work of the scholars and scientists. The main object was the encouragement of learning, but linked to it was another, the glorification of the Ptolemies. The poets had to write odes to

celebrate their fame, the historians histories to record their exploits, the scientists to devise new engines of war. Every possible means was employed to enlarge the library. Ptolemy III ordered that all travellers landing at Alexandria should hand over their books. The originals were kept and papyrus copies were made for them. Another Ptolemy sent a large sum to Athens as security for the loan of the tragedies of Aeschylus, Sophocles and Euripides which he wished to copy. He retained the original manuscripts and sent copies only back to Athens. He did, however, ask the Athenians to keep the money he had deposited as security. When the kings of Pergamon, who were also forming a library, were keenly competing for books, another Ptolemy forbade the export of papyrus. He hoped by this method to prevent them from having any books at all. At all events whatever the means adopted the Library of Alexandria soon grew to a great size. In 48 B.C. it is said to have contained 400,000 or even 700,000 volumes. If we allow for the inevitable exaggeration, the number of books collected was immense. It included Aristotle's library and after the building of the great Serapeum by Ptolemy III a branch or daughter library was formed there, which is said to have held over 40,000 volumes. The Serapeum library was perhaps a reading library for the general public, while the mother library remained the main research library for the scholars of the Mouseion. Where was the library? It was presumably attached to the palace, because Plutarch says that, when Caesar during the Alexandrian War burnt the ships and dockyards which were close to the palace, the fire spread to the warehouses on the quay and to the stores of books. This is one clue for its position, if the book stores were part of the library. Many years ago about 1847 a granite block was found in Alexandria which according to an inscription on it had been made as a case for three volumes of Dioscourides' works. We do not know whether this was found in position or whether it was one of the book-cases of the Library. It is conjectured, however, that the Mouseion stood somewhere about the modern Rue Toussoun.

This area was in ancient times much nearer the sea than it is today and so would have not been far from the naval arsenal which Caesar burnt with the warships.

Of the history of the Library we know little. Was it really burnt during Caesar's Alexandrian War? Caesar himself does not mention it. Nor does Strabo who himself visited Alexandria and saw the Mouseion. Plutarch and Seneca are the first to mention this burning of the library and the latter says 700,000 books were destroyed. This is an obvious exaggeration. Perhaps during the Alexandrian War while Caesar was besieged in the Palace, some damage was done to the Library, but nothing very serious. In compensation Antony is said to have given to Cleopatra the rival library which the Kings of Pergamon had formed in their capital. What was the ultimate fate of the Library we do not know. Probably many of the books found their way at first to Rome and later to Constantinople. Many too probably were destroyed in the various riots and disturbances that occurred in Alexandria under the Roman emperors. There were such troubles in the reigns of Caracalla, Aurelian and Diocletian. Probably in view of the silence of all authorities the main library no longer existed in Alexandria by the end of the fourth century A.D. The daughter library would no doubt have been damaged and ultimately destroyed in the religious riots that ended in the sack and burning of the Serapeum. There is a tale that after the Arab Capture of the city the commander in chief Amr ordered the library to be burnt. It is said there were so many books that the fires they made heated the 4000 public baths of Alexandria for six months. This can hardly be believed. First the man who is given as the source died before the Arab conquest. Second the Arab historian who relates it lived five centuries after the conquest. Third it seems most likely that by the time of the Arab conquest anything left of the library had already been moved to Constantinople.

Famous scholars were put in charge of the Library by the Ptolemies and we have a list of them. Most of them too

seemed to have combined their duties as Librarian with that of tutor to the king's children. Callimachus, the poet who was one of the Library staff but not chief librarian, was the first to catalogue it. He made a catalogue which was not merely an alphabetical list, but contained also a short account of each book and its author. Other scholars or writers were entrusted with the care of special sections of the Library. One dealt with the epic poets, another with tragedy, another with comedy and so on. The more important part of the work of the Librarian and his staff was original research and the production of original compositions, prose, poetry and the like. Alexandria produced or attracted to itself a school of poets which was the first of its day under the Ptolemies. There is no need to list their names, for authors like Theocritus, Callimachus and Apollonius are well known. They practised the previously known forms of poetry, but the one which became under their influence the most characteristic perhaps of Hellenistic or Alexandrian poetry is the epigram, occasional pieces of verse of not more than a dozen lines. The philologists and critics of the library especially its great librarians of whom Aristarchus is the most famous devoted themselves to collecting and editing with introductions and commentaries the works of such authors as Homer. The foundations of Homeric study were laid in Alexandria by these scholars. They also drew up the standard list of the works of the classical Greek authors which have come down to us. They chose the authors they considered supreme in the various branches of literature and selected from their works those they thought were the best. It is to their work that we owe the survival of Greek literature. They also invented the Greek accents by which modern Greek is pronounced in order to indicate the correct pronunciation of Greek since it was then changing. Many people made fun of the Library and its staff. They said it was full of rats and idle talkers. One writer asserted that it was only in populous Egypt that food was given to scribblers who read old books and quarrelled continuously in the bird coop of the Mouseion. Some may have done so, but most of the scholars

of the Library were devoted to their work literary and scientific. We owe a very special debt of gratitude to them for their scientific research. Three great branches of science attracted their special attention, Mathematics, Astronomy and Mechanics. It was an Alexandrian astronomer who first put forward the view that the sun is the centre of our system and not the earth, thus anticipating Galileo by fifteen hundred years. He was, however, not believed. Their astronomical observations are the basis of modern astronomy and they called the stars by names which are still in use. In mathematics they made many discoveries and also classified what was already known by writing text books and treatises. One Alexandrian wrote a text book which remained the standard work on geometry for over two thousand years. It is only comparatively recently that it has ceased to be used in English schools. In Mechanics they made great progress, especially the famous Archimedes whose screw for raising water is still in common use in Egypt. Another almost discovered the steam engine. They devoted much attention to the study of geography and the exploration of the new lands to the east and south which Alexander's conquests had made accessible to them. Natural History was also encouraged and there was a zoological garden at Alexandria. Thus it is perhaps not too much to say that by their original work no less than by their collection and arrangement of all known learning the Alexandrian scholars and scientists laid the foundations for most branches of modern science and literature. Much, too much indeed, of what they wrote has been lost, but fortunately a great deal is preserved as they wrote it and some we possess through the medium of Arabic translations. The foundation of the Library and Mouseion at Alexandria which they really owed to Demetrius of Phaleron was the greatest achievement of the Ptolemies and is their most enduring monument. Their palaces and their luxuries, their armies and their fleets have long since perished and are all but forgotten. The buildings of the Mouseion and the books of the Library have also perished long ago, but the work they inspired still exists. The learning which the Ptolemies encouraged the world can never forget. It is such things, the things of the mind and spirit which survive for ever and are of permanent benefit to mankind.

A.

GREEK INSCRIPTIONS FROM THE SERAPEUM.

The inscriptions here published were found by Mr. Alan Rowe, Director of the Graeco-Roman Museum, Alexandria, in the course of his excavations at the Serapeum during the winter of 1943—44. He has generously given me permission to publish them here and has most courteously afforded me every facility for doing so:

The ruins which lie around the Column of Diocletian, popularly known as Pompey's Pillar, have now at last been definitely proved to be those of the Serapeum by Mr. Rowe who found in August 1943 a foundation deposit of ten inscribed plaques of gold and other materials in a shallow cutting in the rock beneath the southeast corner of the outer wall of the Ptolemaic enclosure. These plaques which Mr. Rowe is publishing elsewhere⁽¹⁾ date the erection of the great Serapeum from the reign of Ptolemy III, Euergetes 1st. Everyone of the five inscriptions here published also mentions the God Sarapis and belonged originally to some dedication to Sarapis or to Sarapis and Isis and the other gods who were worshipped in the same sanctuary. One of these gods to judge by No. 2 was Harpocrates. In any case the presence of so many dedications to Sarapis on the same site helps to confirm, if any confirmation were needed after Mr. Rowe's discovery of the foundation plaques, the identification of the Pompey's Pillar area as the Serapeum, the great Graeco-Egyptian sanctuary of Alexandria.

All these fragmentary inscriptions were found in the debris above the corridor and rooms towards the eastern end of the south side of the Ptolemaic enclosure. A plan is being published by Mr. Rowe in his article already quoted.

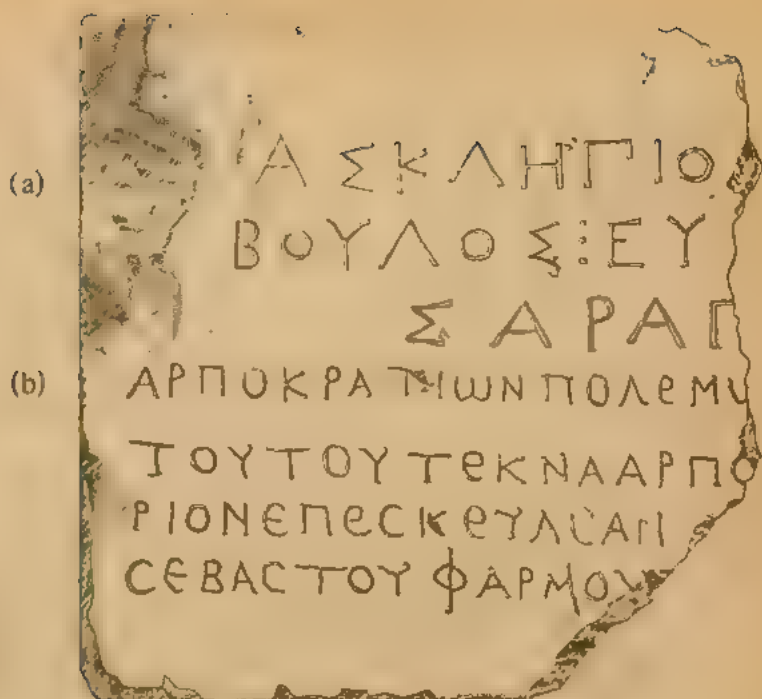
(1) *Annales du Service des Antiquités* 1944.

One of these inscriptions, No. 1 a, from the excellence of its lettering could be dated early in the Ptolemaic period and therefore in the first half of the third century B.C. In other words it may well antedate the reign of Ptolemy III and consequently the building of the great Serapeum. This then may be taken as supporting Tacitus' statement⁽¹⁾ that a sanctuary of Sarapis and Isis stood on this site, then called Rhakotis, before the construction of the great Serapeum which ultimately became so famous for its size, its magnificence, and its library.

1. Inv. P. 8834.

Statue base of white marble, front left hand corner only; height 0.215 m., width 0.21 m., depth 0.17 m. The height is the actual original height, for the top, bottom and side surfaces are partly preserved. The base bears two inscriptions, the original dedication (a) above and a later addition (b) below. The lettering of (a) is 0.015 m. high and is excellent and obviously of early Ptolemaic date, the early third century B.C. The lettering of (b) is 0.01 m. high and probably about the middle of the second century A.D.

(1) *Hist.* iv, 84. The altar from the area round Pompey's Pillar (Breccia, *Alexandria Cat.*, *Iscrizioni Greche e Latine*, No. 6; Schreiber, *Studien über d. Bildniss Alexanders d. Gr.*, p. 251.) which apparently dates from the reign of Ptolemy II supports this.



. These may be restored :

- (a) Ἀσκληπιδόδ [ωρος : Εὐ-]
 -βουλος : εὐ [ξάμενοι]
 Σαράπ [ιδι]

Asklepiodoros and Euboulos in pursuance of a vow to Sarapis.

- (b) Ἀρποκρατίων Πολεμῶ [νος καὶ τὰ ξαν-]
 -τοῦ (του) τέκνα Ἄρπο [κράτει χαριστή]
 -ριον ἐπεσκεύασαν [τὸ ἄγαλμα ἔτους . . .]
 Σεβαστοῦ Φαρμοῦ [θι . . .]

Harpokration son of Polemon and his children as a thank-offering to Harpokrates repaired the statue in the year... of Augustus, Pharmouthis the...

The original inscription shows that Asklepiodoros and Euboulos dedicated something, a statue probably, to Sarapis

in pursuance of a vow, εὐχόμενοι. This use of εὐχαρῆναι is usual and occurs in an Alexandrian inscription published by Breccia⁽¹⁾. The first name must be Asklepiodoros or Asklepiodotos because part of the Δ is preserved. The second name must be some name ending in βούλος and with only one short syllable before it. Euboulos seem the most suitable. The use of ∶ between words is rare in Alexandrian inscriptions and supports the early date suggested.

The later inscription below records repairs to the statue by Harpokration, son of Polemon, and his children as a thank offering. Presumably the statue which stood on the base was of Harpokrates, but whether of bronze or marble we cannot say. A battered fragment of a head in white marble (P. 8915) was found near this base and may be a head of Harpokrates. The Harpokrates statue may have resembled the one found in the shrine at Ras es Soda⁽²⁾. Whether this Harpokration was one of the writers of that name we cannot tell. It was, however, a common name among Greeks in Egypt.

At the beginning of line 2 the engraver seems to have carved τοῦ twice in error. We might assume that the first τοῦ was an error for ΕΑΥ, but then line 1 would be too short.

Line 3, references in inscriptions to the repair of statues are rare. The only example I can find is in a fragment from Cyrene⁽³⁾. Well known cases of repairs to statues are of course those to the Athena Parthenos⁽⁴⁾ and to the Zeus at Olympia⁽⁵⁾. In line 3 ἔτους is suggested for the restoration to make the line the required length. If we wrote L with one or two numerals the line would be short and the fac-simile shows that the lettering is somewhat crowded.

The one word Σεβαστοῦ gives no clue to the date, except

(1) Breccia, *Alexandria Cat., Iscrizioni Greche e Latine*, No. 137.

(2) Adriani, *Annuaire du Musée Gréco-Romain* 1935 — 1939, p. 140, Pl. LVI.

(3) Robinson, *A. J. A.* 1913, p. 176, No. 44.

(4) Dinsmoor, *A. J. A.* 1934, p. 104 ff.

(5) Dinsmoor, *A. J. A.* 1941, p. 399 ff.

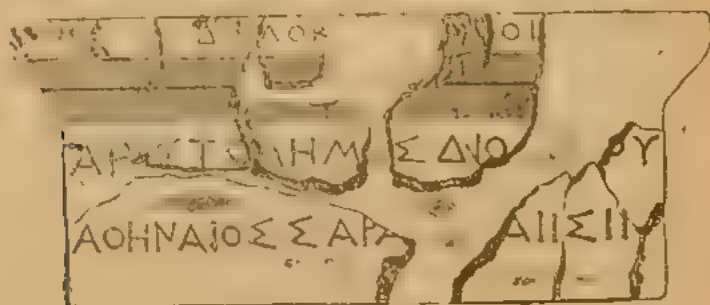
that if the inscription were of Trajan's time we might expect $\Gamma\epsilon\gamma\mu\alpha\iota\zeta\omicron\nu$ to follow. $\Phi\alpha\gamma\mu\omicron\theta\iota\varsigma$ in line 4 was the eighth month of the Egyptian year.

2. Inv. P. 9025.

Base (rectangular in plan) of dark grey granite with a moulding along the upper edge, much broken and some pieces missing; 0.19 m. high, 0.41 m. wide below and 0.48 m. wide with moulding, 0.23 m. deep below and 0.30 m. with moulding; moulded edge projects 0.07 m. and its flat upper member is 0.025 m. high. In the top in the centre is a cutting roughly rounded which measures 0.13 m. across and is 0.05 m. deep. In it were two iron dowels run with lead to attach something to the base. Part of one iron dowel and of the lead round it is still preserved. Of the inscription on the moulded edge the fragment with the letters $\iota\omicron\kappa$ does not actually join the rest, but clearly belongs. Its exact position cannot be determined.

The base bears two inscriptions (a) the main inscription on the front of the base and (b) a supplementary inscription on the flat upper member of the moulded edge :

(a) The main (lower) inscription, the letters of which are 0.02 m. high,



can be restored as :

$\text{Ἀριστ} [\acute{\omicron}] \text{δ} \mu\omicron\varsigma \Delta\iota\omicron\delta [\acute{\omicron}\rho] \omicron\upsilon$

$\text{Ἀθηναῖος Σαρὰ} [\pi\epsilon\iota\kappa] \alpha\iota \text{ Ἴσι}$

Aristodemos son of Diodoros, an Athenian, to Sarapis and Isis.

The lettering is good early Ptolemaic, probably of the Third Century B.C.

In line 1 the father's name must be Διοδώρου or Διοδότου or some similar name for part of the second Λ is preserved.

In line 2 the form Σαράπει is suggested because Σαράτιδι is too long and Σαράπι too short for the space. Σαράπει though not given in Stuart-Jones' new edition of Liddell and Scott's Greek Lexicon is the form used on the plaques of the foundation deposit of the Serapeum found by Mr. Rowe⁽¹⁾. The form Ἴσι is also not given by Stuart-Jones though Ἴσει is. If a form Σαράπι on the analogy of Ἴσι were possible it would fit the space even better. For the form Σαράπει we can compare the forms Ὀσίρει, Ἀνούβει and Ἴσει⁽²⁾. It would appear that in earlier Hellenistic times at least the forms Σαράπει, Σαράπι and Ἴσει, Ἴσι were often used. Mr. Iliffe has kindly told me of an inscription⁽³⁾ in good Hellenistic lettering of the third century B.C. found at Samaria which has the forms Σαράπι and Ἴσι. It is a wedge-shaped block of black granite and may be of Egyptian origin.

(b) The supplementary (upper) inscription has letters which are 0.015 m. high.

The position of the fragment $\lambda\omicron\kappa$ is not determined, but it can hardly come after the letters $\sigma\iota$.

We could restore this as :

• Δηλ $\lambda\omicron\kappa$ [λῆς 'επ] οἱ [ησε]

The name Δηλοκλῆς is possible according to Bechtel-Fick⁽⁴⁾ and if we restore ἐποίησε or ἐποίησι there is just room for a short ethnic name or for a short name in the genitive as the patronymic. A short inscription of this kind is more likely to be an artist's signature than anything else, but no artist of this name is known. The lettering is less careful than that of the

(1) *Annales du Service des Antiquités* 1944.

(2) Dittenberger, *O. G. I.*, No. 60; Breccia, *Alexandria Cat., Iscrizioni Greche e Latine*, No's. 5,23,118.

(3) Palestine Museum, No. 966; Crowfoot, *P. E. F. Q. S.* 1931, p. 141, 1932, p. 17; Ronssel, *Rev. Et. Grecques* 1934, p. 253; *Suppl. Epig. Graec.* VIII, 1, No. 95; Crowfoot, *Samaria Buildings*, p. 65 ff.

(4) *Griechischen Personennamen*, s.n.

main inscription, but can be of the same date, third century B.C.

What stood on this base? What was the dedication of Aristodemus the Athenian? The sinking in the top of the base makes it unlikely that it was a bronze statue; for there are no foot marks, but only a rough cutting approximately circular. (Fig 1). A pillar, square or round in section, could have been the central support of an Apis bull in black granite like the well known one from the Serapeum⁽¹⁾. An Apis bull in black granite or even bronze would be a most appropriate dedication to Sarapis and since we already possess one example from the Serapeum, it is quite possible that some of the other smaller dedicatory bases like the present example once carried Apis bulls in black granite or bronze as offerings to Sarapis.



Fig. 1.

3. Inv. P. 8735.

Slab of nummulitic limestone, 0.035 m. thick, two fragments.

(a) Broken on all sides, 0.23 m. x 0.145 m.

(1) Botti, *Catalogue du Musée Gréco-Romain*, p. 316, No. 370 fig.; Breccia, *Alexandrea ad Aegyptum* (English Edition), p. 114, fig. 47.



(b) Broken on all sides, 0.085 m. x 0.05 m.

The letters are 0.0275 m. high except in the first line of (a) where they were originally taller.

The first (a) may be restored thus :

Σαρά [πιδι]

τὸ]ν δρόμον ἐλλ

. . . . σίου

To Sarapis

. . . . the dromos



The δρόμος was the avenue of approach to an Egyptian temple and Strabo says it was a hundred feet wide and three or four times that in length⁽¹⁾. It was bordered on either side by a row of sphinxes.

This is the first evidence for the existence of such an avenue at the Serapeum of Alexandria.

The Pseudo-Callisthenes⁽²⁾ speaks of a δρόμος τοῦ μεγάλου

(1) See Strabo, xvii 1.28 p. 805; *B.G.U.* iv 1130 1.10; Dittenberger, *O.G.I.*, 156 1.52 (Canopic Decree), 178 1. 17 (= Milne, *Cairo Cat.*, *Greek Inscriptions*, . 9201 p. 20); Plutarch, *de Iside et Osiride*, p. 359 A. (2) 1 31.4.

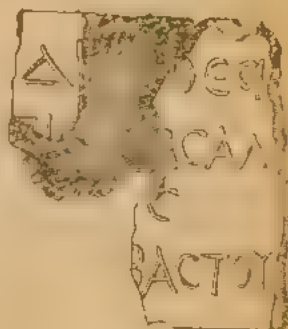
Σαρᾶτιδος which was constructed on the course of a canal called Rhakotis existing at the time of the foundation of the city.

The lettering is good and indicates the first century A.D. as the probable date.

4. Inv. P. 9026.

Base of black granite, fragment of front right hand corner, two pieces joined; 0.08 m. x 0.07 m. and 0.06 m. deep. Part of finished surfaces on top, bottom and right side preserved.

The letters are 0.0125 m. high and probably of the second century A.D., perhaps of the Hadrianic or Antonine period.



This can be restored:—

[Αὐτῷ Ἡλίῳ Μεγάλῳ Σαρᾶπι] δι [καὶ] Θεοῖ [ς]

[συνναῶν] αὐτῷ

. ς

[. ἔτους Σϵ] βασιτῶν

To Zeus, Helios the Great, Sarapis and the Gods in the same temple in the year . . . of Augustus.

For the restoration compare No. 5 and the references there quoted.

5. Inv. P. 8892.

Slab of grayish white marble, fragment broken at bottom and sides, finished at top; 0.15 m. x 0.13 m. and 0.03 m. thick. Letters 0.025 m. high.



This may be restored thus :—

[Δι' Ἡλί] φ Μεγ [άλφ Σαράπιδι]
[Και τοῖ] ς συνν [αίς Θεοῖς ὑπέρ]
[σωτηρίας Αὐτοκράτορος Καί-]
[-σαρος]

To Zeus, Helios the Great, Sarapis and the Gods in the same temple for the safety of Augustus Caesar.
on the analogy of the restored inscription⁽¹⁾ of Hadrianic date on the support of the Apis bull in black granite found in the Serapeum and of other inscriptions⁽²⁾ found in Egypt and dating from the reigns of Trajan and Hadrian and later. Compare No. 4 above.

This fragment may be dated to the Hadrianic or Antonine period.

Alan J. B. Wace

(1) Breccia, *Alexandria Cat., Iscrizioni Greche e Latine*, No. 68.

(2) Dittenberger, *O. G. I.*, No. 678 l. 3; *C. I. G.* No's 4713 and 4713 e; Breccia, *op. cit.*, No's 87, 97, 100.

THE DISTINCTION BETWEEN PRIMARY AND SECONDARY QUALITIES.

According to Locke, who familiarised the distinction⁽¹⁾, primary qualities are in natural objects whether we perceive them or not; and the ideas that we have of them are like the qualities which actually inhere in the natural object. Locke gave two lists of them: (*a*) bulk, figure, number, situation, motion or rest⁽²⁾; and (*b*) solidity, extension, figure, mobility⁽³⁾. The difference between the two lists is not, however, very material.

Secondary qualities, on the other hand, are not in natural objects, *i.e.* they do not inhere in objects; for they are powers and not literally qualities. Secondary qualities, which have their basis in the primary qualities, are powers that act upon our senses and cause ideas of several colours, sounds, smells, tastes, and so on⁽⁴⁾. Here the sense-data of secondary qualities are not like those qualities, or rather powers, themselves.

Before going on to consider the distinction, it would be well to note a third form of qualities, which Locke just called "powers". Such powers, which again are based upon the primary qualities, are what effect changes in the primary qualities of other natural objects, so as to make them operate on our senses differently from before. Thus fire effects changes in the primary qualities of wax, so that the idea we have of its shape becomes changed⁽⁵⁾. Such powers it will be convenient to distinguish as causal characteristics.

(1) John Locke, *An Essay concerning Human Understanding*, Bk. II,

Ch. VIII, §§ 9—26.

(2) *Id.*, § 23.

(3) *Id.*, § 9.

(4) *Id.*, § 23.

(5) *Id.*, § 10.

When Berkeley comes to discuss the distinction (having in mind both Locke and Malebranche⁽¹⁾), he insensibly ascribes to Locke a different definition of secondary qualities: for he took them to be the sensory qualities themselves, *i.e.* what Locke called the *ideas* produced by secondary qualities⁽²⁾. The conflict of usage should be noted for purposes of clarity. So far as concerns Berkeley it is not so important as it might seem, because there is good reason to hold that in spite of confusing the *terminology* he did not misunderstand Locke's *position*⁽³⁾, and because his subsequent arguments as he framed them are independent of (and hardly refer to) the terminology in either sense, Locke's or his own. In the first place he argues that extension and motion depend upon and cannot be abstracted from colour and the like, for one cannot conceive of extension and motion without such qualities⁽⁴⁾. Consequently, since these depend upon the percipient, then extension, motion, and so on must do so too. It is clear that this argument is of equal merit if we use "secondary quality" in his sense or replace it by "idea of secondary quality" in Locke's sense. Secondly Berkeley urges that exactly the same trains of reasoning that show that colour and the like depend upon being perceived apply equally to extension, motion, and so on⁽⁵⁾. Thus if red is relative to the conditions in which it is viewed, so is roundness, for a circular coin held obliquely to the eye looks elliptical. Here again the argument is unaltered in value if we put "secondary quality" in Berkeley's sense of "idea of secondary quality" in Locke's. He has, however, introduced or implied a change of terminology.

Berkeley introduced no corresponding change with regard to the denotation of "primary quality". He discusses the

(1) A. A. Luce, "Note on 'Did Berkeley Misunderstand Locke?'," *Mind*, N. S. Vol. XLIX, No. 194, London, 1940, p. 262.

(2) George Berkeley, *The Principles of Human Knowledge*, ed. Jessop. London, 1937, § 9.

(3) W. H. F. Barnes, "Did Berkeley Misunderstand Locke?", *Mind*, N. S. Vol. XLIX, No. 193, pp. 52—7.

(4) Berkeley, *Op. cit.*, § 10.

(5) *Id.*, § 14.

qualities denoted by this phrase as if they were of the secondary kind, for he talks of colour and figure in the same breath⁽¹⁾, so that in this context he is taking shape to be an idea of a primary quality; but he does not misinterpret Locke's meaning, which was that there were objective qualities in natural objects resembling such ideas as shape. But it may legitimately be asked if Berkeley successfully proved that the primary qualities are dependent upon the percipient in the same way as the secondary. Now what he did in fact was not to argue about the Lockean primary qualities but to discuss the particular qualities given by Locke under this heading. Hence what he did was to prove not that the primary qualities are mind-dependent, but to stress that shape is as relative to perception as is colour; in other words he not so much proved something as stressed what Locke had already said in a different form. However, he did reach the conclusion that the primary qualities, in the Lockean sense of powers, were non-entities, by his claim that these cannot resemble the corresponding sensory qualities, since nothing can be like an idea but an idea⁽²⁾, and by his argument that a qualitativeless extension (which covers "powers") is inconceivable.

The distinction was also discussed by Hume⁽³⁾ and Bradley⁽⁴⁾, who interpreted it in exactly the same way as Berkeley. They repeat his arguments in a less complete form, and Bradley adds several others. Since, however, these relate to the special viewpoint of his own metaphysic, there is no need to consider them here.

The dilemma which the distinction gives rise is this: the mind-dependence of the primary qualities seems to be established, and yet this leads to Solipsism, for nothing public and mind-independent remains to natural objects.

(1) *Id.*, § 7.

(2) *Id.*, § 9.

(3) David Hume, *A Treatise of Human Nature*, ed. Selby-Bigge, Oxford, 1896, pp. 226 – 31; *A. Enquiry concerning Human Understanding*, ed. Selby-Bigge, Oxford, 1902, sect. XII, para. 122.

(4) F. H. Bradley, *Appearance and Reality*, London, 1897, Ch. I.

A considerable step towards clarifying the issue has been taken by Professor Moore⁽¹⁾. Let us call secondary qualities in the Berkeleian interpretation "sensory qualities". Thus colours are sensory qualities, but so also are shapes, as Berkeley maintained. Now, in contrast to these, Professor Moore has drawn attention to others involved in a certain class of statements, in which words, such as "red" and "round", do not occur in the same sense: thus to say that a tarboosh in the dark or unobserved is red, or that a coin unfelt is round, is not to say that these objects present "literally" red or round sensory qualities, as they would if they were being perceived. In explanation of this Professor Moore points to a *fact*, a fact about language, that it is *correct usage* to talk of unobserved red tarbooshes or round coins, as when we say "I must fetch my red tarboosh from the spare-room". Thus there is a sense of "red" in which unobserved objects can be called "red", and in this sense red is not a sensory quality; and the same holds for spatial words either in visual or tactual contexts. Now according to Professor Moore, words standing for qualities in this sense can be defined in terms of the same words in the sensory usage, or rather statements embodying the one can be translated into statements embodying the other. Thus "There is a red tarboosh unobserved in the next room" can be replaced — as indeed Berkeley suggested⁽²⁾ — by "*If* anyone goes into the next room and *if* there is light, then he can see a tarboosh which is red, sensibly red". In short, unobserved redness is a potential redness expressed in terms of hypothetical situations connected with actual or sensory redness. This brings the usage in question under the general heading of phenomenalism, and such non-sensory qualities may be called "phenomenalistic".

(1) Given by Prof. G. E. Moore in lectures in 1933 but not published. Obviously he cannot be held responsible for someone else's exposition of views he has not put in print — moreover I have not followed closely his own mode of exposition.

(2) Berkeley, *Op. cit.*, § 3.

What, then, is the effect of the distinction between phenomenalistic and sensory qualities upon the traditional one? It is twofold: on the one hand, it admits the Berkeleyan contention, not exactly that the primary qualities are mind-dependent along with the secondary, but that there is a sense in which "round" is mind-dependent just as much as "red", so that in this respect there is no difference between the ideas of primary and secondary qualities in Locke's sense; but, on the other hand, it denies the solipsist conclusion and accepts the Lockean position that there is something public and objective over and above the sensory qualities of which a percipient is aware, *i.e.* it accepts, not exactly that the secondary qualities are independent of the mind in the same way as the primary, but that there is a sense in which "red" is independent of the percipient just as with "round". Thus it is clear that there is no very simple relation between primary and secondary qualities on the one hand and phenomenalistic and sensory qualities on the other; for primary and secondary are each divided into two classes, one phenomenalistic and the other sensory, and the four classes obtained are recombined according to a different principle. The new distinction, therefore, makes some attempt to do justice to the idea that some qualities are objective while others are mind-dependent.

It may now be asked if this distinction succeeds in doing justice to the original idea or to the observed facts. It certainly does not seem to endow colours with more objectivity than they in fact possess, but we may feel that shapes are being denied a certain literal objectivity. Thus it would seem to be a matter of no account to the general process of the universe, should colours not exist in a literal way, but it is difficult at first sight to admit the same thing of shapes, on account of their bearing on the physical motion of bodies after impact. A superficial answer to this difficulty is readily available, in that what is relevant to motion is not shape but impenetrability; but of course impenetrability is just another phenomenalistic quality (for Locke another primary quality).

Now it would be more fitting to class such qualities as

this as *causal* — and there is no reason to suppose that Locke would have refused this amendment. If so, Professor Moore's distinction does all that is required of it, so far as primary and secondary qualities are concerned; it becomes a question of whether his distinction leaves room for a satisfactory account of causal properties.

These can be described in phenomenalistic terms by defining, for example, impenetrability in terms of the motion of bodies after collision; thus phenomenalistic impenetrability of a given natural object is not a literally existent quality, but a permanent possibility of affecting the motion of another natural object in close spatio-temporal proximity with the given one.

However consistent this may be on phenomenalistic grounds, it conveys the impression that causal properties are reduced to possibilities that become actual when required; and the objectivity of a natural object is likewise nothing more than a set of possibilities. A phenomenalist may believe this, but it contains this difficulty. If the possibilities are hypostatised, the phenomenalist outlook is violated, but if not, then a possibility is nothing actual, and it is hard to understand why possibilities should become actual in the orderly way in which they do.

Thus, though Professor Moore's treatment of the distinction, because it succeeds in giving us a linguistic power of talking as if unperceived colours and shapes existed when they literally do not, may be regarded as clearer and more satisfactory than those of Locke or Berkeley, I contend that the extension of this principle to causal properties is not reasonable, and that in fact his distinction remains reasonable only if something more real than phenomenalistic possibilities exists to account for causal processes.

In view of this difficulty about causal properties, it is tempting to pay more attention to the widespread feeling that there is something "real" about geometrical qualities, as compared with the sensory kind, which is not provided for in a

literal sense by Professor Moore's phenomenalist definition. Professor Broad has taken this approach and has adhered as closely as possible to the traditional distinction between primary and secondary qualities⁽¹⁾. He suggests the following definitions : "A Primary Quality is a determinable characteristic which, we have reason to believe, inheres literally and dyadically in some physical object in some determinate form or other." "A secondary Quality is a determinable characteristic which certainly inheres or seems to inhere literally and dyadically in the objective constituents of some perceptual situations in some determinate form or other, but which there is no reason to believe inheres literally and dyadically in any physical object." He adds that "A primary quality may, but need not, inhere literally and dyadically in some objective constituent" Divesting these expressions of the technicality "objective constituent of a perceptual situation", which for the present discussion may be replaced by "sense-datum", and omitting the qualification "dyadic", which he requires in order to eliminate complications concerned with certain views of perception he has been considering, we can express his meaning briefly : primary qualities inhere literally in a determinate form in natural objects, and *may* inhere similarly in sense-data; secondary qualities inhere literally in a determinate form in sense-data only. Professor Broad agrees with Locke's classification, but he adds electric charge and magnetic properties to the list of primary qualities, which it is here urged should rather be classed as causal characteristics. He has made the traditional distinction clearer by taking account of the distinction between sensory shape and geometrical shape; but he differs from Professor Moore in two respects : he does not define the primary qualities phenomenistically, and he provides no counterpart to sensory colour in natural objects.

What he has in mind is that, when a natural object manifests a sensory shape, this affords some guide to the geometrical

(1) C. D. Broad, *The Mind and its Place in Nature*, London, 1925, p.p. 206-8. This was written in all probability before Professor Moore arrived at his own view.

shape of the object, whereas sensory colour has no counterpart that it resembles and therefore provides no guide to knowledge of the object. In brief there is something more "real" about shape than about colour. This would seem to be supported by the close connexion between geometrical shape, size, and position, on the one hand, and the causal characteristic of impenetrability on the other. Impenetrability occurs in some places and not in others, and what marks off the two sets of places is a combination of geometrical shape, size, and position; and this leads us to suppose that since impenetrability is objective these qualities must be also. The strict conclusion, however, is not that shape and so on are objective, but that they have the same status as impenetrability. To amplify this, we must of course exclude sensory impenetrability, exemplified by the sort of discontinuity sensed in the fields of visual and tactual motion that is described as "knocking one's foot against a stone". Non-sensory or natural impenetrability may be described as the kind of power that one billiard ball has to repel another one. Then geometrical shape, size, and position will merely describe the boundary that divides space into a part where this repulsion is strongly operative from the remainder where it has little effect. Hence if impenetrability literally exists only when repulsion occurs, the same applies to geometrical shape and the like. One may add that, if a distinction between primary and secondary qualities is desirable, it would be more reasonable to class the primary qualities as causal, each of which would have a corresponding sensory form, and these forms would be secondary qualities — it would probably not be difficult to fit colour into this scheme.

Professor Broad's treatment of colour requires a few comments. Colour (usually) pervades a place and is bounded by some sensory shape of some sensory size. Hence colour is some guide to the whereabouts of a centre of repulsion or something having some degree of impenetrability. The reason why colour would seem to be less important in thus locating such a centre is that it primarily indicates geometrical position, which humanly speaking is in a different category from

geometrical shape and size : when we wish to discuss the impenetrability of a natural object, its geometrical position is *given*, and we are solely interested in the boundary of that position. Hence position, though objectively just as important as shape and size, is humanly disregarded when we are considering a centre of repulsion. Again, so far as colour indicates such a centre, without indicating position, it does so by indicating sensory shape and size, so that it operates indirectly or by two steps, by indicating sensory shape and size which in their turn indicate the centre of repulsion.

This seems to explain why sensory shape and size are regarded as more important than colour for yielding knowledge about natural objects, although there is nothing in the discussion to warrant our concluding that geometrical shape and size exist literally any more than does colour. The causes of sensory colour can, together with geometrical shape, size, and position, be put along with impenetrability — though, strictly, shape and the like should not be called causes but aspects of impenetrability.

It is evident that either upon Professor Moore's or Professor Broad's approach, causal characteristics are basic, and our final view about what distinction to make between primary and secondary qualities will depend upon what view is taken of them, and in particular of impenetrability. Are we to interpret it phenomenally with Professor Moore ? This we have seen reason to regard as unsatisfactory. Are we then to interpret it literally with Professor Broad ? There are certain difficulties about this. How is it to be defined ? Berkeley's arguments against Locke's notion of powers would probably hold equally here. It would be free of these difficulties if it were defined in terms of sensory qualities ; but this would be a phenomenalist procedure, which would render the position no more satisfactory than Professor Moore's. The only alternative is that impenetrability should be a postulate.

If we wish to avoid the phenomenalist definition, according to which there would be no literal impenetrability apart from occasions of actual repulsion, it is difficult to avoid thinking of it as inhering in a *persisting surface*, and it is difficult to give an account of such a surface without using the notion of impenetrability, which would be circular, or of sense-data, which would lead back to phenomenalism.

These difficulties disappear if we substitute the agency of subatomic matter for phenomenalist possibilities of occurrences, *i.e.* for causes in the phenomenalist sense, or for impenetrability in a literal sense. Subatomic matter, being a verified scientific hypothesis, is not open to Berkeley's objections. What sort of status, then, have sensory qualities, geometrical qualities, and phenomenalist qualities? Clearly the first are to be regarded as the effects of subatomic activity, which occur when perceived and not otherwise. Impenetrability would consist in the repulsion of one cluster of subatomic entities by another cluster; it would arise when one cluster approached another but not exist literally so long as the two clusters were sufficiently far apart. Phenomenalist qualities would have no existence other than a linguistic one conferred upon them by the practical need for a concise language.

This does away, however, with Professor Moore's distinction, so far as his main purpose in making it was concerned. His purpose was to leave something objective in the natural object, and this was effected by having recourse to a fact about correct usage of language. This purpose can be fulfilled, however, by the scientific hypothesis that the ultimate furniture of the natural world consists of subatomic entities. And it would seem that the wrong inference is drawn from the phenomena of language. It is true, as Professor Moore contends, that an unobserved tarboosh is red; but is language so logical as to give this statement the meaning that he ascribes to it? Surely the facts are these. The statement

that an unobserved tarboosh is red is never contradicted by subsequent experience. Hence the statement is regarded as true, and we may, if we wish, say that there is a usage of "true" that is compatible with this procedure. But on scientific grounds there is no ground for supposing that the tarboosh remains literally red, and therefore the phenomenalist use of words comes to be nothing more than an inexact use, which reflects our ignorance. Hence instead of concluding that phenomenalist qualities possess a *linguistic* existence, we should say rather that they possess a *fictitious* existence.

In short, there is nothing objective to be found in the distinction between primary and secondary qualities and kindred distinctions; and in fact no distinction of this kind is needed for describing the facts of sense perception.

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A word may be added on the relation of "ideas" of qualities in either Locke's or Berkeley's sense to "sense-data" as this word is currently used. Though there is scarcely any difference between them, it would not be true to say that they are exactly the same in meaning, at any rate when they refer to visual contents. A visual sense-datum is a patch of colour, that is to say it is a particular patch characterised by some absolutely specific shade of colour. But in being a patch it has some absolutely specific visual shape (also an absolutely specific visual size, and so on). Hence one reason why a sense-datum is not the same as the Berkeleyan secondary quality is that the sense-datum includes a characteristic that for Berkeley was a primary quality. He himself would probably have agreed with the current use of "sense-datum" so far as this point is concerned, for he wished to show that there was in fact no difference in kind between the primary quality of shape and the secondary quality of colour, as he used these terms. Locke, too, might have

accepted the word as standing for a pair of ideas, one of a primary and the other of a secondary quality. Another distinguishing feature is this. The sensory qualities, which characterise particular patches, are *universals*, sensory universals, for they can characterise several numerically different patches; but the patches are particulars. Thus a sense-datum is a particular characterised by universals. For Locke and Berkeley, however, ideas and sensations were instances of universals, but not particulars like patches.

It will thus be seen that the difference between a secondary quality and a sense-datum, though it exists, is not of great significance.

J. O. Wisdom.

**A BRITISH CONSUL GENERAL, IN TUNIS,
RICHARD WOOD(*).
1856 — 1879.**

Richard Wood arrived in Tunis on board the steamer, "The Conflict", on the 20th June, 1856. A specialist in Near Eastern political questions, he had gained his experience through long service in Constantinople and Syria, and through the different missions which he had undertaken to Asia Minor, Mesopotamia, Kurdistan and Irak. These missions were of such a nature that they enabled him to come into constant touch with the different peoples and rulers of those countries. When still young, he was appointed to the service of the British Embassy at Constantinople. There he must have been struck by the crumbling civilisation of the Near East, having lived among the people and adequately studied their condition under the despotic and corrupt Turkish rule. His long residence in Beirut and Damascus afforded him opportunity to witness the fanaticism of Moslems against the Christian subjects of the Porte, to see murders committed with impunity, insults offered without redress, the roads unsafe, tribunals venal in the extreme, the irregular Turkish troops working havoc and destruction wherever they went, the people of the villages obliged to abandon their homes on their approach, the almost periodic invasions and depredations of the Bedouins, the unrest of the Druses, jealousies between the pashas and daftardars, sedition flagrant in the towns and the helplessness of the local authorities. Many times, when Consul at Damascus (1841 — 1855), did Wood approach the Pasha "to rouse him from the apathy with which he viewed the disgraceful

(*) For a full study of the subject, see M. M. Safwat : *Tunis and The Great Powers*.

scenes around him". "To my surprise", he wrote, "he was either ignorant or pretended to be so of what was occurring within view of his palace"⁽¹⁾.

To sum up he had "had ample opportunities of acquiring information respecting the organisation of the Empire, the feelings, the wants and the condition of the various races and creeds". Although sympathetic to the people, Wood never felt any antipathy to the decadent Empire. Perhaps he might have noticed that despite their suffering, the people had almost lost conception of good government. Moreover, under this corrupt government they had no military obligations to fulfil, could easily escape the hands of the law, and could despise Jews and Christians as inferiors. Wood had been present at the Syrian revolt, and indeed, had actually helped to excite the people; the object of the revolt was to overthrow the rule of Muhammed Ali which had aimed at securing more justice, order and toleration but also conscription and regular taxation, an obvious menace to the privileges enjoyed under a corrupt and disordered Turkey. Wood became to know that the name of the Turkish Sultan still aroused the enthusiasm and fidelity of the Moslems, for to their minds Turkey was the stronghold of Islam against aggressive Christendom. It is easy to understand therefore, why Wood should be one of those few statesmen who not only believed in the authority of Constantinople, because the interests of his own country were concerned, but also from personal conviction.

When still in the Near East, Wood became alive to the possibilities for action, possessed by a reformed Eastern country. It became clear to him that the reformed Egyptian soldiers, trained by French officers, were capable of great achievements. He thus came to the conclusion that the greatest Moslem Power, whose preservation had become one of the

(1) See Foreign Office Records. Wood to Derby Dec. 4, 1877, Wood to Aberdeen, British Foreign Minister, Nov. 20, 1841, Jul. 30, 1843, Wood to Stratford Canning, Ambassador in Constantinople May 31, 1845, Wood to Rifaat Pasha Oct. 18, 1841.

cardinal points of British foreign policy, could still be saved from ruin by adopting some of the liberal institutions of the West. His knowledge of the Moslem religion, as explained to him by the jurisconsults of Constantinople and Damascus, and his knowledge of Arabic confirmed his conclusions. He discovered that there was nothing in the Moslem religion adverse to progress and adaptation to time and place. This conception was revealed in his lengthy despatches in which he quoted verses from the koran or Traditions of the Prophet that encouraged education, and the search for truth. This conception of his became a deep-rooted conviction, for he wrote on December 4, 1877, even after the complete failure of reform in both Turkey and Tunis. "I have especially dwelt upon the Islamic Law in order to disprove the erroneous impressions generally entertained that the Ottoman Government cannot fulfil its promises of reform on the grounds that those reforms are themselves at variance with the precepts of the Koran" In the same despatch and at great length, he tried to show the untruth of the statement "that the intolerance of Islamism is not only a bar to religious liberty but likewise to progress and civilisation it being adverse to the acquirement of knowledge." His belief that the Turkish Empire was able to progress and fit to survive impelled him to play no small part in bringing about the downfall of the newly born Egyptian empire, which the British diplomats believed to have been directed by French policy to serve a French purpose.

Wood, Consul at Damascus, witnessed with rapture the victory of Palmerston's management of the Egyptian question. At Damascus he contracted a friendship with the Patriarch of the Maronites, supported the Druses in their claims against the Porte, and succeeded in effecting an amicable settlement of the differences between the Christians and the Druses of the Anti-Lebnaon. Wood seemed to have enjoyed great popularity among the Syrians who found in him a champion of their cause. The British influence was naturally supreme in those parts where the defeat of the Egyptian forces brought in its train the defeat of French influence. It was just at this time,

in the year 1855, that Richard Wood was appointed to the position of British Consul-General in Tunis; and was destined to play a great part in the history of the Regency for a long period, extending from 1855 to 1879, and to show what a decisive rôle could be played in European politics and in the internal affairs of a country by an energetic consul who remained for a long time in his post.

When Wood arrived at the "White City" he found the British Consulate in a position very different from that which it had occupied under Sir Thomas Reade⁽¹⁾. The English Consulate had been the supreme influence in the Regency earlier in the nineteenth century, during the Napoleonic wars and the Restoration. But the French military conquest of Algeria changed the whole situation; it made an effective and permanent impression upon the mind of the Bay, and spurred Turkey to try to regain its long forgotten and nearly lost position in the Regency. The terrified Bays, placed between two imminent dangers, found that "only one thing could be worse for Tunis than its extinction by the Porte and that was its absorption by France"⁽²⁾. It was not surprising therefore, that the Bays looked to British help to set bounds to the ambitions of the two rivals. In this way British influence recovered, to a great extent, from the check it had received. But the short period of Sir Edward Baynes (1849-55), together with the existence of a French large army in Algeria, the frequent visits of French squadrons to Tunis and the stream of French decorations raised French influence to a predominately exceptional position.

The British Consul was ill-treated on his arrival, for Muhammad, the reigning Bay, had not forgotten that the English Consul was not accredited to him directly by the Queen. The English Consulate was driven out of its summer residence, and when Wood applied for another, he "was shown to a ruin . . . and to a small house fit for a tomb." He had

(1) Sir Thomas Reade was Consul-General in Tunis from 1824-1849.

(2) Broadley : *The Last Punic War*. 1882 Vol. I. p. 98.

to reside in an unhealthy place, "until sickness and the want of water compelled him to accept the hospitality of his French colleague". Little regard was paid to his representations and on his way to Court, he was subjected to insults sometimes "even apostrophised as Kalb Roumi, Christian dog"⁽¹⁾.

But Wood was not the man to be trifled with; he had been reared in the school of the East, and fighting for position and influence was no new thing to him. In a despatch to Lord Clarendon of Sept. 23, 1856, he thought that his position would not be improved until a naval demonstration was made in the waters of Tunis. In the meantime he was not content to await the action of his Government, but made it known to the Bay that such treatment would entail "his immediate discomfiture", and that if the Tunisian Government resorted to its old ways of testing by vexations his temper and courage, it would find in him more than an equal opponent. In October the Tunisian Government was obliged to beat the retreat and Wood restored to the British Consulate some of its past prestige.

Wood's attempts at reform were not less successful. If the French policy was intent on "civilising rather than colonising North Africa," Wood was not haunted by such illusions. He stressed the necessity for reform in order to deprive France of any opportunity for interference, in order to raise the interest of Europe in the fate of the Regency, and consequently to protect it from the French danger which he conceived to be imminent. On the 18th August 1857, he advised his government to recommend to the Bay that in "his own interest, in the interest of his preservation and in that of his people, he should not stop short in a system of ameliorations and reforms, upon the introduction of which would exclusively depend the interest which the Great Powers might take in him"⁽²⁾. With the co-operation of his French colleague, the Bardo was forced

(1) See Foreign Office Records. Wood to Clarendon, the Foreign Secretary, Jul. 15, Sep. 9, 25, 1856.

(2) *Ibid.*

to promulgate the famous Organic Laws of September 1857. With the same vigour and conviction, the British Consul pressed Es-Sadek Bay to grant the Constitution of April 1861 which limited the Bay's power, defined the authority of ministers and officials and recognized the rights and duties of all settling in the Regency.

In this article I will not dwell at any length on the efforts of Wood at reform or at securing concessions; I will rather confine myself to the description of his Turkophil policy. Wood had been brought up in the East, and therefore fully realised that France was endeavouring through Muhammed Ali to dominate the regions that controlled communications between East and West. A true disciple of Palmerston and Stratford, he felt it his mission to expel French influence from those parts which possessed a special interest for his country. On several occasions, he denounced French designs in those parts as being "in defiance of international law and the rulers of the country"⁽¹⁾. When at last French designs in these regions had been thwarted, Wood solemnly promised that "no efforts would be spared on his part at any sacrifice to keep British influence intact"⁽²⁾. On his appointment to Tunis, Wood discovered important documents that revealed to him the struggle which been waged for decades between the English and French Consulates. This struggle was no longer merely concerned with precedence in kissing the hands of the Bay or in taking the place of honour beside him. The struggle had now developed into one for the control of a weak and helpless government. In the archives of the British Consulate, Wood followed with attention the neat dispatches of Sir Thomas Read. There he might have visualised this elderly gentleman "suspending his amicable relations with the French Consul (de Lesseps)", warning the Bay against French designs, and explaining his ideas with regard to the St. Louis Memorial

(1) Came to power on Sep. 24, 1859.

(2) Foreign Office Records, Wood to Colonel Rose Chargé d'Affaires in Constantinople Mar. 2, 1853.

(3) Wood to Malmesbury British Foreign Minister Aug. 27, 1852.

which France was building on the site of Old Carthage, a memorial "more adapted for a fortress than a chapel"⁽¹⁾. In this way, Wood's knowledge of the East was supplemented by the rich experience of Sir Thomas Reade.

In his memorandum of the 20 th August, 1859, the British Consul reviewed French schemes in the Mediterranean with "grave suspicion". From the relentless efforts of her agents to separate both Tunis and Egypt from Turkey, he concluded that France was undoubtedly entertaining "a secret design to take military possession of Egypt and to annex Tunis to her African possessions by holding out the hopes of obtaining their independence through her medium and protection". Referring to the French and British positions in the Mediterranean, he observed that French policy had never been anything but prejudicial and injurious to England", and lamented that France occupied now in the Mediterranean a position far superior to that held in the eighteenth and beginning of the nineteenth century. She had now "an African possession, a numerous and well-organised army in Algeria, inured to the climate and acquainted with Arab mode of warfare", and above all, a powerful steam navy that linked her possessions with the mother country. He believed that the real aim of French Mediterranean policy was to force Great Britain "to look upon the destinies of her great Indian empire as dependent upon the relations she might maintain with France." He described the war waged by French agents on British interests, and their strenuous efforts to supplant British influence as "unfortunately not always in the most legitimate manner" It was with considerable alarm that he noticed that France was treating the Algerian tribes in such a way as to excite the jealousy of their Tunisian brethren and make them look forward to French rule. He looked upon the French attitude towards Turkish-Tunisian relations, as denoting an unwillingness to allow any reconciliation between the Regency and the Ottaman empire, on account of a desire to annex Tunis. Wood suspected that

(1) F. O. Reade to the Foreign Office, Feb. 15, June 7, 1830 and Mar. 18, 1841.

France was eager to seize those Tunisian ports of strategic importance which she did not already possess in Algeria. Apprehensive of this danger, he concluded that in possession of a well-organised army in Algeria and well-equipped Tunisian ports, France could easily rise to dominance in the Mediterranean⁽¹⁾.

But England, upon whose friendship the Bays relied to set bounds to French as well as Turkish designs in Tunis, discouraged them, refusing "steadily and uniformly" to acknowledge their independence, and even instructed Wood to point out that "it was of the greatest importance to England to maintain the dependent position which the Bay of Tunis occupied with regard to the Sultan"⁽²⁾.

Wood, fully conscious of the Bay's dissatisfaction with regard to the attitude adopted by England, awaited a suitable opportunity to reinforce his argument. This opportunity soon presented itself, when Roches, the French Consul-General, demanded that the Bay should send a mission to Paris to apologise for neglecting to take "public notice of the Emperor's fêtes"; on the Bay's refusal, the French agent suspended diplomatic relations⁽³⁾. The British agent now took upon himself the task of explaining to the Bay why England had chosen such a policy with regard to his political status. Acquainted as he was with the psychology of Oriental princes, Wood began by impressing upon the Bay that England took "the liveliest interest in his happiness and the welfare of his family and children, as well as the prosperity of the country." He pointed out to the impressionable Bay that he was surrounded by great dangers, and that in fact he was placed "bein-en-Narain". The Bay lived in Tunis ignorant of the real motives of the Powers, while England, better acquainted with them, was induced by her own interest "to screen the Bay from all apparent, it might be distant, but not an impossible

(1) Foreign Office Records.

(2) Foreign Office Records. Draft to Wood. Aug. 13, 1856.

(3) Wood to Clarendon Sep. 23, 1856.

danger". "If the British Government", went on the dramatic Consul, "endeavours to anticipate any danger to his descendants, is it just for a mere matter of diplomatic form you should feel any annoyance, and accuse it of indifference or of any attempt to lower your political position?" Had not England defended the independence of Moslem princes "by the sacrifice of her blood and treasures". On personal and family interests of the Bay, Wood dwelt so long as to claim that "England cared more than he (the Bay) for the safety and well-being of his own offspring the blood of his heart". In this strain, Wood continued his speech, till the Bay's eyes moistened and his ministers drew back with emotion"⁽¹⁾.

Having created a suitable attitude of mind by this appeal to sentiment and instinct, Wood now turned to the more practical side of the matter. "Great and powerful nations", he said, "are impelled to expansion, and therefore they are disposed more or less to absorb the lesser neighbouring States". If the safety and independence of such weak countries were not guaranteed by Europe and "the Law of Nations", their doom was inevitably sealed. He illustrated this by the case of Belgium. "Did the Bay enjoy the same security?" he asked. For this reason the Prince of Tunis must not allow personal ambitions to stand in the way of security. According to Wood, the Bay had everything to fear from French aggression, but nothing from the Sultan, "to whom he was tied by a common religion as he ought to be connected with a similarity of political interests". The English Government had repeatedly recived the assurance of the Sultan that he was ready to treat the Bay with "respect and moderation", and that they were determined to preserve his rights of self-Government completely inviolate". The Consul's belief in the strength of Turkey convinced him that the safety of Tunis could only be permanently secured by extending to it the integrity which Europe had recently guaranteed to the Ottoman empire"⁽²⁾.

(1) Wood to Clarendon, Oct. 8, 1856.

(2) Ibid. Wood to Russell, Nov. 24, 1859.

The British Consul believed neither in the possibility nor the expediency of Tunis coming under the direct control of the Sultan, for both France and Tunis would successfully oppose any such attempt. Therefore Turkey had to be so generous as to confer upon Tunis the rights and privileges which the latter had for so long enjoyed. In the first place, the Porte had to recognise the hereditary rights of the reigning family, and to promise not to interfere in the internal affairs of the Regency. The Tunisian flag had to be preserved, as well as the privilege of bestowing decorations. The Bays were to continue their relations with foreign countries unmolested. In return, the Bays had to acknowledge formally the suzerainty of the Sultan, to continue their requests for the investiture, and to notify the public of this important event. Money had to be coined and the khoutbas delivered in the name of the Sultan. With reference to the tribute, the British Consul saw no reason why Tunis should not pay it as long as it was sufficiently moderate⁽¹⁾.

In drawing out these conditions, the British Consul took into account not only the interests of Tunis, but also those of the foreign residents together with the exigencies of foreign trade. The sense of the practicable never forsook him. This is best revealed in that condition which allowed the Bay the right to carry on his foreign relations undisturbed, for if the Porte had been permitted to prevent this, the Turks would have been able to curtail foreign interests, and would have experienced no difficulty in escaping the obligations of old treaties. That Wood never lost the sight of the practical aspect is quite obvious from the manner in which he persistently stressed the necessity for the preservation of these rights which the Bay had enjoyed for centuries. His choice of the Porte's 'suzerainty' rather than its 'sovereignty' is ample proof of his insight, for Tunis was far removed from the seat of the Turkish Government, and the Porte was everlastingly absorbed in the Balkans and Asia, a fact which was bound to deter

(1) Foreign Office Records Memorandum enclosed in his despatch to Russell of July 31, 1858.

the Sultan from giving sufficient attention to Tunisian affairs. A sovereignty would naturally increase the responsibilities of the Porte, since it would lead sooner or later, to a quarrel with France; while as suzerain, Turkey "could as occasion required, act the part of a mediator between her vassal and his powerful neighbour with greater safety to herself, with more efficacy and with more dignity".

Encouraged by the friendly co-operation of France in inducing the Bay to carry out reforms, the British Government grew desirous of solving the question of the political status of the Regency. She instructed Cowley to ascertain "how far the French Government would be disposed to co-operate with Her Majesty's Government to induce the Bay of Tunis to recognise more completely the suzerainty of the Porte". To that suggestion Walewski replied that France could not abandon her "traditional" policy, and that she abided by the maintenance of the status-quo. The British Ambassador in Paris reported, "My apprehension is that the French Government will never be induced to favour any arrangement, which will imply a recognition of the Porte's sovereign authority in the Regency of Tunis. France is content to abide by the actual connection between the Sultan and the Bay, without examining whether that connection renders the Bay dependent or independent of the Porte. If obliged to pronounce herself, it would probably be in favour of the Bay's independence"⁽¹⁾

The adamant firmness of the French Government, in contrast to the vacillation of the Porte, and the reluctance of England to pick new quarrels with France, postponed the settlement of the question. The English Government even informed their Consul that "the subject presented many difficulties". Wood was left with the mere hope "that time and the adroit seizure of favourable opportunities might possibly mend that position"⁽²⁾. But Wood had to face new difficulties for Es Sadek, the successor of Muhammed Bay, had adopted

(1) Cowley to Malmesbury Sep. 5, 1858.

(2) Malmesbury to Wood Sep. 4, 1858. Wood to Malmesbury, Nov. 5, 1858.

completely anti-Turkish views. This attitude spurred the British Consul to action, and without loss of time hastened to show the Bay the necessity of linking his fate with that of Turkey. And reminding Es-Sadek that the people were already pro-Turkish in feeling, and that if it came to their ears that their Bay favoured French influence, they would undoubtedly withdraw their allegiance from him⁽¹⁾.

Only with reluctance did the Bay consent to the policy of Wood, and the British Consul suggested that the Bay's envoy to Constantinople, whose mission was to announce the advent of Es-Sadek to power, should also "evince a disposition" to come to an agreement with Turkey. In compliance with this suggestion, the Turkophil Khair-ed-Din and General Hussain were selected for this delicate mission, with instructions to conform to the advice of the English Ambassador in Constantinople, who on his part, was continually preaching moderation towards Tunis.

Although Turkey had begun to perceive the expediency of the English point of view, yet she could not summon up new courage to make a final settlement of the question. Whereas the attitude of the British Government did not extend beyond mere sympathy, the opposition of France was relentless. It was these two facts that rendered abortive that mission, which returned in January 1860 with a Firman no different from those of preceding years. Thus the success of the British Consul was limited to the conversion of the authorities of Constantinople to his views for the realisation of which they considered the time to be still unripe.

During the Bay's visit to Emperor Napoleon III at Algiers in September 1860, Wood did not conceal his anxiety. The visit did show the Bay his own irremediable weakness and only bred despair. "Being comparatively very weak", the Bay apologised to Wood, "I am forced to conciliate my formidable neighbour by all means in my power. Any two common Arabs on the frontier can bring about a serious

(1) Wood to Russell, British Foreign Minister, Nov. 3, 24, 1859.

misunderstanding between us; but had my country been separated from Algeria by the sea, my conduct and my policy would have been very different from what they are present' ⁽¹⁾.

But the glaring weakness of the Sultan made a bad impression on the Government of Tunis. In despair the latter now questioned the expediency of having her destinies linked with an empire so indifferant and decrepit ⁽²⁾. As yet she had only received "illusory and vain promises of good will and nothing more". In face of this attitude of mind, and of daily French pressure, the British Consul never despaired, for he was not the type of man to stand still, but was always ready to contend for victory. To the argument that Turkey was unable to vindicate her rights, and that she had done nothing to save Algeria, he replied that the fate of Algeria, was directly traceable to the disobedience of the Dey towards the Sultan. Although Turkey might be weak, still it was impossible for France to attack any of her dominions without opening the Eastern question. Wood considered that the Bey ought to decide, while there was still time, so that his country might not develop into "a mere French prefecture" ⁽³⁾.

This sentiment of the Tunisian Government underwent a serious change in 1863, when de Beauval was entrusted with the mission of restoring French supremacy in the Regency and driving Khaznahdar, the Prime Minister, out of power. The threatening tone of the French Government, the violence of their Consul, and the menace of military intervention, all went to convince the Bey that safety was no longer to be enjoyed on this side of the Algerian frontier. The French had indeed gone so far as to make a final demand that the Bey had either to surrender or find his territories invaded by French soldiers. The situation in Tunis was complicated in 1864 by a fierce uprising among the warlike tribes, with whom the French seem to have been in constant touch ⁽⁴⁾. The government

(1) Wood to Russell Sep. 29, 1860.

(2) Wood to Bulwer, British Ambassador to Turkey May 12, 1862,

(3) Wood to Russell. January 18, 1862.

(4) The real motives of Beauval's proceedings were elaborated by =

of the Bay was utterly helpless; the Bay informed the English Consul, that. "Rathen than yield to pretentions that have no paraliel, he prefers to succumb with honour to the superior material force of so powerful a Government as that of France to which he can offer no resistance; but that he can lead his minister by the hand from one court to another to give Europe an ôccular spectacle of their boasted justice, civilisation and the respect they had for the liberties and rights of weaker states"⁽¹⁾.

The situation was at last saved by the friendly attitude of Wood and the interference of the British Government. From the very beginning the British Consul adopted an open and sympathetic attitude towards the hapless government, and placed his advice and services at the disposal of the Bay. It was on Wood's advice that concessions were finally made to the insurgents. He tried to dispel the fears aroused by his French colleague whose conduct he viewed as "impolitic and unwise",⁽²⁾ and actually lent the Bay a steamer for the transport of troops and munitions. Fully aware of the Baroo's impotence, and suspecting the designs of France and Italy, he even suggested to Admiral Smart the necessity of temporarily occupying some strong positions in the Regency, a plan which did not meet with the approval of the Foreign Office. Acting as mediator between the Government and the insurgents, he assured the latter of the Bay's good faith. Their terms accepted, and their pockets replenished with lavish gifts, the insurgents realised that a prolongation of the insurrection could only compromise the political existence of their country, and consequently decided to submit. But after the French Agent had spoken violently to the Bay himself, that the latter was left no alternative but to appeal to England. So elaborate

= Wood in a despatch of the 23rd April 1864; they were the destruction of British interests, the annulment of concessions granted to English subjects by depriving the Bay of his freedom of action and supremacy of French influence.

(1) Wood to Russell, Aug. 30. 1864.

(2) Wood to Russell, April 23, 1864.

were Wood's reports of his colleague's conduct, that Russell, the Foreign Secretary, was induced to interfere energetically. Consequently, Cowley was instructed to acquaint Drouyn de Lhuys "of all the errors of which M. de Beauval was guilty". The English Government discovering, however, that the Beauval continued his policy of terrorism, no longer relied on the repeated assurances of the French Foreign Minister, and made the final appeal to the Emperor himself. In accordance with his instructions, Cowley, made it clear to the Emperor that England "had both political and commercial interests to watch over at Tunis, and could not submit to the doctrine laid down by de Beauval that French influence ought to be supreme", and that the French agent had abused his power. Napoleon III assured the British Ambassador that he was going to recall his hot-headed agent and that he "harboured no designs whatever for the acquisition of territory in that direction" for "he had enough upon his hands in Algeria"⁽¹⁾. It was therefore the friendly and effective intervention of the British Government which rescued Tunis from the tightening grip of France and raised the prestige of England in the eyes of the people and of the Government. They now fully realised the advisability of resorting to the protection of the Porte and the advice of England. The English Agent played no little part in effecting this cordial relationship, and acquainted the Bey with the instructions of his Government that he must on no account yield to any fresh attempts by the French at interference in his internal affairs. The British Consul also warned the Bey against deluding French agents into the belief that he was in any way indebted to French protection for his freedom and independence, and to take advantage of every opportunity to declare publicly to all the foreign agents "that as a Moslem Prince ... his religion and his duty must impel him to look to the Sultan and not to the Christian princes for aid and protection, that neither his ancestors nor himself had ever questioned the suzerainty of the Sultan ..."⁽²⁾. The Bey was so gratified with this communication that "he twice rose to embrace the

(1) Cowley to Russell, despatches of Dec. 6, 15, 18, 1864.

(2) Wood to Russell January 31, 1865.

English Consul !” And his satisfaction was complete when Rear-Admiral Yelverton arrived to hold an investiture of the Bath.

The victory was Wood's this time; his French colleague had to accept a serious diplomatic defeat. A Tunisian mission proceeded to Constantinople where it was graciously received by the Sultan. And for the first time Turkey acknowledged the rights of the Bay. For fear of French opposition, this settlement was not embodied in a firman but in a simple Vizirial letter⁽¹⁾. The firman itself was issued at a late, when France lay prostrate after the disasters of the Franco-German War.

But the Franco-German War presented the opportunity for vindicating the rights of Rome upon Carthage. Italy claimed Tunis “both as a field for her activity in Africa, and as a guarantee for her security in the Mediterranean,”⁽²⁾ and Pinna, the Italian Consul, was guided by the obsession that Florence had military, economic and commercial interests of vital importance in Tunis. The Italian agent was ever watchful for a chance for active interference, and this was provided by alleged violation of Italian domicile in a farm by the local police. This incident of the Gadeida, trifling in itself, was sufficient to arouse Italy to action, the Italian Consul was happy to break off diplomatic relations with the Bay. Terrified at this sudden decision, at a time when French help was not available, the Bay sought the intervention of the nearly British Consul. This offer was gladly accepted, and resulted in the Bay's consent to the demands of Pinna. The Italian Government though accepting the Tunisian concessions, did not consider them sufficient to guarantee her interests in the future, and consequently demanded the right of jurisdiction over property held or rented by Italians, and also over Tunisians in their employ. This new pretension was at variance with the provisions of Italian treaties with the Regency, and meant

(1) Wood, to Russe January 12, 1865.

(2) Croce : A History of Italy 1909 pp. 108, 109. .

a surrender of the Bay's territorial sovereign rights⁽¹⁾.

It is no wonder then that the Bay accepted at once Wood's advice and declared that Tunis was part of the Ottoman empire, and that consequently he was going to appeal to the Sultan, "to protect his own rights against the establishment of foreign territorial jurisdiction over Ottoman possessions"⁽²⁾. General Hussain was also deputed to Italy with instructions that "in the event he should fail to remove the difficulties ... (he had) to seek the intervention of the Turkish Ambassador". In the meantime the Bay had appealed to England and France. Such an attitude Wood applauded, while the French agent gravely urged the Bay not to accede to the Italian demand which signified the destruction of his autonomy.

In Florence, the British and Turkish Governments offered their good offices, but the Italian Government declined on the ground that the question concerned Italy alone. Visconti-Venosta, the Italian Foreign Minister, was declaring in one breath that "it was impossible to tolerate the proceedings of the Tunisian authorities", while in the next he indicated that "he would not accept Tunis, if it was offered him", but at the same time he was making military preparations at la Spezia. On the other hand, the Italian press was loud in its denunciation of Tunisian aggression, and talked of a revenge that would permanently establish the authority of young Rome in Carthage.

When Visconti-Venosta refused the intervention of England and Turkey, the combination of these two powers took a more formidable appearance. Sir Augustus Paget, the British Ambassador in Rome, while showing that he could no longer "defer the expression of the regret felt by Her Majesty's Government", observed that "pressure could be exercised by other ways than fleets and guns"⁽³⁾. On the other hand, Poutiades Bey, the Turkish Minister in Florence, declared that

(1) Wood to Granville British Foreign number Despatches Janu. 14, 17, 1871.

(2) Wood to Granville Janu. 28, 1871.

(3) Paget to Granville Feb. 20, 1871.

"the employment of force to compel the Bay to accede to the Italian demand would be considered as an act of hostility towards Turkey⁽¹⁾. In face of this opposition, the Italian Government, consented to arbitration and made the amazing discovery that right did not lie on the side of the strong.

The crisis of 1871 had thus passed in the same way as that of 1864, and just as the French pretensions had led to conciliation with Turkey, so did the Italian claims in 1871 help to cement that friendship. The British influence, thanks to the courage of the British Consul rose supreme. The Turkophil policy of Wood was now successful. As soon as the Italian danger passed, Es-Sadek requested Turkey to fulfil the promises of the Vizirial letter of 1864, and as he was still apprehensive that the Sultan might raise new claims as his price of protection, the Bay sought the support of Great Britain to induce the Porte to grant the new Firman in accordance with its reiterated promises. Khair ed-Din was chosen for the mission to Constantinople, on account of his Turkophil sentiments. In his anxiety to see the negotiations successful, Khair-ed-Din used every argument with the Ottoman Ministers for a permanent settlement of the Tunisian question, which arguments were reinforced by the frequent remarks of Sir Henry Elliot, the British Ambassador. The Porte was claiming the right of controlling the foreign affairs of the Regency as well as the payment of a tribute. That this attempt did not meet with the approval of Great Britain is clearly illustrated by Earl Granville. "You will point out", he wrote, "the inexpediency of attempting to introduce any alteration into relations existing between the Porte and the Bay inconsistent with the vizirial letter, as any attempt of that kind on its part may lead to complications with foreign powers and give rise to questions which may involve much trouble to the Porte"⁽²⁾. The Porte, confronted with this opposition and at the same time desirous to settle the question of Tunis, decided to issue the Firman of

(1) Herries, Chargé d. Affaires in Italy, to Granville, Feb. 19, 1871.

(2) To Elliot, Oct. 7, 1871.

October 23, 1871, which fixed the mode of administration and "settled in a legal manner", the question of the government of Tunis.

In this Firman, the Bay was referred to as "out Vizir" and the "Governor-General of the Province of Tunis". The privileges "conferred upon him" were due to his "praiseworthy conduct, and to the "services" he had contributed. "Our subjects" was the term used for the Tunisians, while Tunis was "this province of our empire". Hereditary succession to power was granted on several conditions. All existing relations were to be preserved and advanced, and in view of "the legitimate bonds between Tunis and the Caliphate", the Khouthas were to be delivered and money was still to be coined in the name of the Sultan. On acceding to power, the Bay had to notify the Sultan and ask for the Investiture. In the event of Turkey being involved in war, Tunis was bound to furnish a military contingent. The Bay was to retain his right to appoint and dismiss officials according to the rules of justice and equity, while internal administration was to be in conformity with "the Sacred Law and other laws of the Ottoman empire". In the case of foreign affairs, the Bay's right to negotiate with other Powers was confirmed, even though he had not the right "to conclude with these Powers conventions or other international acts, having reference to political affairs, acts of war, or rectification of frontiers, questions which appertained to "the Sultan's sacred right of sovereignty". In view of the poverty of the Tunisians, the Regency was to be exempted from the payment of tribute.

The Firman was gratefully received by the Bay, and with "sentiments of intense joy by the natives". Wood himself, was glad to see that his efforts were at last successful, "after many years of patient and unremitting perseverance". In Europe, England, Austria and Germany recognized the new political status of Tunis, and congratulated the Bay on his connection with Turkey. France, though having registered in the short space of two years, the fall of Napoleon III and the Government of the National Defence and though she stood

humiliated and sorrowful, yet she had now confided her destinies to Thiers, the eminent statesman and the man that laid the foundations of French traditional policy in North Africa. The French Government protested, but without the power to threaten. Italy did not recognize the Firman.

The British Consul-General continued to enjoy supreme influence in Tunis, and succeeded in resisting any attempt made to undermine his position. Although the fall of Khaznahdar was a cause of considerable dismay to Wood, yet he soon came to an understanding with Khair-ed Din who succeeded the fallen minister and gave him his full support. For the new Tunisian Prime Minister was a serious partisan of reform and a sincere Turkophil. But the year 1878 was a fateful year in Tunisian modern history. Great Britain decided in Berlin to give France a free hand in Tunis, and Wood was not acquainted with the decision of his Government. Gone were the days when Great Britain upheld Turkish territorial integrity.

In Tunis, the Salisbury-Waddington agreement was no secret. Rumours circulated that "England offered the annexation of the Regency to France." The Bay was alarmed, the population excited and Sir Richard Wood⁽¹⁾ feared that his life's work was to be so easily shipwrecked. He asked Lord Salisbury whether he could give the statement "a formal contradiction". "I have to inform you", replied the Foreign Secretary, "that no offer of annexation of Tunis has ever been made by Her Majesty's Government"⁽²⁾. So far as technical diplomatic terms were concerned, Salisbury's statement was an accurate account of what had taken place. So Wood hastened to declare to the Bay that these rumours were groundless and even delivered a letter in person to the Bay assuring him of "the sincere interest which Her Majesty's Government

(1) Was knighted on Dec. 1, 1877.

(2) To Wood Aug. 7, 1878.

took in his prosperity and the well-being of the Regency !"(1)
The Beaconsfield Government did nothing to encourage or discourage Wood's policy until the French Government decided to get rid of the British agent. Wood had become the symbol of the old British policy and the symbol of opposition to France. Waddington, the French Foreign Minister, therefore approached Lord Lyons(2) with incessant complaints, which were eagerly supported by Bismarck. Salisbury was obliged on March 6, 1879, to inform Waddington that he had suppressed the Consulate-General in Tunis. The last despatch of Sir Richard Wood was written on the 14th March 1879.

Muhammad Mustafa Safwat

(1) Wood to Salisbury Aug. 12, 20, 1878.

(2) The French Ambassador in Paris.

WATER SUPPLY OF THE EGYPTIAN OASES.

INTRODUCTION.

The water supply of the Egyptian oases is derived entirely from artesian wells. Indeed, it may be said that the very existence of these oases, with their extensive cultivated lands depends on their artesian wells; for in these regions there is practically no rain.

The entire water supply is obtained from deep wells bored into underground sandstone beds which carry water under pressure. Judging from the material brought up to the surface during drilling operations, the water-bearing sandstone seems to belong to the Nubian Sandstone series which has been proved to underlie the whole Libyan Desert.

The geological conditions of the Nubian Sandstone series, both the stratigraphy and the physical texture of the rock, are favourable for the creation of an ideal medium for water storage.

The sandstones are highly porous and are interspersed by impervious beds of shales, overlain by absolutely water-tight beds and underlain by impermeable crystalline rocks⁽¹⁾.

I. Wells and their Yield.

A. Depth of Bores.

The depth to which it is necessary to bore from the floors of the oases is fairly accurately known by the natives, as the casing of wells is usually only sunk to the top of the water-bearing sandstone. From the following table it can be noticed that the depth varies from place to place.

(1) Beadnell. *An Egyptian Oasis*. p. 124.

Dakhla Oasis ⁽¹⁾ . Qasr	35 m. (Bir El Dinaria is 129 m. deep)
Budkhulu	45 m.
Gedida.	80 m.
Mushia	86 m.
Qalamon	50 m.
Hindaw	60 m.
Rashda	70 m.
Mut.	30 m.
Masara.	60 m.
Sment	60 m.
Balat	40 m.
Tendida	47 m.
Kharga ⁽²⁾	120 m.
Baharia ⁽³⁾	30 m.
Farafra ⁽⁴⁾	25 m.
Siwa ⁽⁵⁾	20 m.

The figures show that the depth is never great. This may be due to the fact that the sites of the oases wells coincide more or less with the crests of anticlinal folds which have brought the water-bearing strata within a reasonable proximity of the ground surface. Moreover, the oases are natural excavations whose floors have been much lowered by denudation and had it not been for this circumstance, the boring of wells in these regions would have been prohibitive owing to the expense involved⁽⁶⁾.

(1) Headman of boring operations in Dakhla.

(2) In 30 of the wells bored by the Corporation of Western Egypt at Sherika the depth varies from 230 to 480 feet. Files of the Corporation.

(3) Headman of boring operations in Baharia.

(4) Headman of boring operations in Baharia.

(5) Omar. Report on the Water Supply of Siwa Oasis. 1937. p. 2.

(6) Beadnell. *An Egyptian Oasis*. p. 123.

B. Quality of The Water.

Salts.

The water is of great purity and very clear. When taken direct from a well, it forms a palatable water free from all danger of contamination, though in some cases it is slightly sulphurous and ferruginous⁽¹⁾. An analysis of the water shows the following results :

The average amount of salt in 11 springs in Baharia is
204 parts per million⁽²⁾.

The average amount of salt in 17 springs in Dakhla is
205 parts per million⁽³⁾.

The average amount of salt in 6 springs in Kharga is 506
parts per million⁽⁴⁾.

The average amount of salt in 52 springs in Siwa is 2230
parts per million⁽⁵⁾.

From these figures it appears that the waters vary considerably in the amounts of salts they contain. The soluble salt contents of the water in Baharia, Dakhla and Kharga is, low compared with that of Siwa, and is, in fact, similar to that of the Nile, which varies from about 100 to 210 parts per million⁽⁶⁾. Comparison shows that the water from Siwa contains from 5 to 10 times as much salt as that obtained from the other oases. All the well waters in Siwa are exceedingly brackish. The excessive amount of dissolved salts in Siwa water seems to have affected the soil considerably. The land is always exposed to the dry hot atmosphere, so irrigation is immediately followed by rapid evaporation which, not only causes the accumulation of the

(1) Beadnell. *An Egyptian Oasis*. p. 137.

(2) Azadian — *Les Eaux d'Egypte*. Tome deuxieme pp. 444 — 445.

(3) *Ibid.* pp. 412 — 416.

(4) *Ibid.* pp. 275 — 386.

(5) *Ibid.* pp. 462 — 464.

(6) Worseley. *The Soils of the Libyan Oases*. Cairo. 1930. p. 6.

salt contents of the water on the surface of the land, but also helps to raise further salts from underneath by capillary attraction. In this way, the land has lost its fertility and the plants which flourish there are salt loving species which have adapted themselves to the new conditions.

For purposes of irrigation the water contains no fertiliser. It is devoid of the fine silt which characterises the water of the Nile and which replenishes the land of the Nile Valley. It does not improve the fertility of the oases but on the other hand, it may cause great damage if not carefully and wisely utilised. Beadnell, referring to the water supply of Kharga, states that the utilisation of this water for purposes of irrigation would, at the rate of three gallons a minute per acre, mean an annual deposition of over three tons of sulphate of potash and common salt on each acre of land, an amount which would, of course, spell ruin to its agricultural value in a very short time⁽¹⁾. However, it can be stated here that the irrigation system followed in the oases, has been skilfully adopted by the farmers to suit the nature of their water supply as well as that of their land. This has, no doubt, tended to maintain a soil of but slightly diminished fertility, notwithstanding the long period through which it has been utilised.

Oases.

One of the most noticeable features of the artesian water is its highly effervescent character when it reaches the surface⁽²⁾. In some of the new wells the water is strongly charged with minute bubbles of gas, while in many of the older wells where water meets impediments in its course, the gas rises to the surface in a slow procession of large bubbles. Analysis shows that the gas consists almost entirely of nitrogen, only small quantities of oxygen and carbon dioxide being present⁽³⁾.

(1) This applies only to the sub-artesian supplies derived from the surface sandstone.

(2) Beadnell. *An Egyptian Oasis*, p. 136.

(3) Hughes. *Dissolved Gases of the Well Waters of the Western Oases*. *Cairo. Scient. Journ.* Vol. 5. 1910. pp. 218 — 221.

The results of the analysis of samples collected from Dakhla are as follows⁽¹⁾ :

Samples No	1	2	3	4	5	6
Carbonic Acid	1.58	2.20	1.68	4.80	9.07	6.53 ⁽²⁾
Oxygen	1.13	traces	0.48	0.25	traces	traces
Nitrogen	97.80	91.80	97.84	94.95	94.93	93.47

Samples collected from Siwa, Baharia and Kharga show the same constituents.

The presence of such gases in the oases water combined with the fact that the iron pipes used for casing the wells corrode within a short period made some people believe that the corrosion of pipes is caused by the presence of gases. But Mr. Hughes states that "There appears to be nothing in the gases which would occasion the corrosion of the iron pipes⁽³⁾". Little thinks that the rapid corrosion which is not uncommon in Dakhla and Kharga is due to the presence of bands of alum, magnesium sulphate, iron pyrites etc. in the water-bearing sandstone⁽⁴⁾.

Temperature.

The suggestion that the water of certain wells in the oases, was at times cold and at others warm, as put forward by many travellers has since proved to be untrue. It must be remembered that to judge the temperature of the water by feeling it with the hand is often misleading, especially in desert regions where the diurnal range of temperature is very great. By day water whose temperature is as high as 24°C. would seem cold if felt by the hand, while the coldness of the night would doubtless make the water seem warm.

The readings of reliable thermometers have proved that the temperature of individual wells though constant all the year

(1) Buckley. Report on the Oasis of Dakhla. p. 114.

(2) Figures represent percentages.

(3) Buckley. Report on the Oasis of Dakhla. p. 115.

(4) Little, Files of the Frontier Administration. Letter addressed to the Director of Front. Admin. in reply to correspondence dated 21/11/1983.

round vary considerably from one another. The temperature of water of certain deep wells in Dakhla is higher than in the other oases. The highest temperature recorded is 40°C. but but the average is considerably below this figure (probably 30°). The northern part of Dakhla is the place where wells attain the highest temperature. This is clearly shown in the following table in which the temperature of four wells in Qasr is recorded⁽¹⁾

Bir El Dinaria	40° C.
Bir El Abid	38.5°C.
Bir El Hamia	39° C.
Bir El Omda	40° C.

In Kharga, it is seldom that we meet with temperature over 32°C., the well water at Sherika varies from 30°C to 31°C.⁽²⁾

The average temperature in Baharia is 27.5°C. with variations from the mean of only 3° or 3.5°C.⁽³⁾

In Siwa it is much the same and figures show uniformity in temperature. This uniformity is probably due to the fact that most of the wells are shallow and of equal depth.

The cause of the high temperature of the water is difficult to explain. Beadnell has suggested that it cannot be due to the heat derived from the surface of the desert, nor is it caused by the heat engendered by friction between moving masses of rock⁽⁴⁾. The only reasonable explanation, he thinks, is that the water has been heated in its underground passage at a great depth from the surface⁽⁵⁾. There is a probability that the waters in their underground passage, are heated far above the temperature at the outlet of the wells. This is indicated by the fact that, although the average temperature at the exit may be only 30° or 31°C. occasional figures up to 40°C. are met with. In the deepest and newest wells the

(1) Azadian. *Les Eaux d'Egypte*. Tome 2. p. 383.

(2) Beadnell. *An Egyptian Oasis*. p. 136 (degrees are given in Fahrenheit)

(3) Azadian. *Les Eaux d'Egypte*. Tome 2. p. 437.

(4) Beadnell. *Dakhla Oasis*. p. 73.

(5) *Ibid.* p. 73.

water rises not only from a greater depth, but owing to the freedom of the pipe from sand, clay, etc. at a far higher velocity, so that much less heat is lost to the surrounding rocks during its upward course. But old wells, as might be expected, have in nearly all cases a much lower temperature than the modern wells; in them the water rises slowly owing to the pipes being more or less blocked up by sand blown from the surface, and by the deposits from the water itself.

C. Yield of the Wells.

Most bores show a marked decline in discharge for some time after completion, and except in special cases, it seems doubtful if large bores can be expected to maintain their original flows for a long period of years. The bore No. 13, sunk at Sherika in the northern part of Kharga Oasis by the Corporation of Western Egypt yielded thus:—

Jan. 1907 an output of 112 gallons per minute.

" 1908	"	65.5	"
" 1909	"	47.4	"
" 1910	"	42	"
" 1911	"	41	"

It is a common occurrence throughout the world for the yield of individual artesian wells to diminish, and in many instances the wells of an entire basin suffer a general and gradual failure. Slichter attributes such cases to the low porosity and transmission power of the water-bearing strata and remarks "It is believed that during the early years in the history of wells the water withdrawn represented a supply stored in the rocks, but not readily transported by the strata to meet the enormous draft"⁽¹⁾. Following him, Beadnell would explain the decline in the output of the oases wells by postulating that during the early part of its existence the well draws its supplies from fully saturated beds, the water being forced into the bore from every side not only through the

(1) Record of the flow of wells bored by the Corporation supplied by Handy Eff. p. 26.

(2) Quoted by Beadnell,

pores but through any fissures the bore may have struck. As time goes on the strata get more or less depleted and the pores become choked up by the deposition of mineral matter and the well becomes more and more dependent on the fissures for the maintenance of its supply. This condition would certainly lessen the volume of water pushed into the bore from its sides and accordingly reduce the discharge of the wells.

The oases have been obtaining their water supply from artesian wells continuously for at least 2500 years⁽¹⁾. In certain areas some of the ancient wells have, in recent times, reached a condition either of being extinct or of yielding only feeble flows. Evidence is obtainable which proves that in many cases these wells formerly produced discharges of considerable volume⁽²⁾. When such extinct or nearly extinct wells are cleared out, or when new bores are put down near them, it is not uncommon occurrence to obtain discharges of similar magnitude to those originally yielded by the old wells⁽³⁾. According to Beadnell it would appear that after the strata had become locally exhausted, the plugging of the channels of the wells (owing to the diminution of the flows) had allowed sufficient time for the strata to become once again fully saturated⁽⁴⁾.

In the same way if a flowing bore is closed for some time then reopened its discharge is found to increase. In one of his experiments, Beadnell mentions that a bore which

(1) Beadnell, The Underground Waters of the Oasis of Kharga, Cairo Sc. Journ. Vol. 5 (1911) p. 2.

(2) Little, Files of the F. A. Letter addressed to the Director in reply to a correspondence dated 21/11/1923.

(3) Evidence is derived from the fact that much of the land which was formerly irrigated by the water of the well is now uncultivated for lack of water.

(4) Ain Ramah in Kharga Oasis and Ain Tagzirt in Siwa are good examples.

(5) Beadnell The Underground Waters of the Oasis of Kharga, Cairo Sci. Journ. Vol. 5 (1911) p. 2.

was following at the rate of 225 gallons per minute was closed for five days, and on re-opening, the discharge was found to be 370 gallons per minute, showing an increase of 145 gallons or about 65% (1). The pressure during the same time rose from below 9 to 16 pounds per square inch. Grabham (2) does not seem to accept Beadnell's view that the exhaustion or accumulation of water in the sandstone around the bore can be attributed either to depletion or the filling of pores, since these must remain full as long as they are below the level of the static head (3). The water rises to the top of the bore and flows freely because the ground level is beneath the static potential. The flow is caused by the pressure of the water in the permeable beds pressing into the bore, and so long as this remains full to the surface, the water bearing beds cannot be depleted. The pressure from the sides of the bore against the weight of column of water leading to the surface would tend to maintain saturation (4).

Grabham would account for the diminution and subsequent recovery in the flow of artesian wells, under the conditions mentioned, by supposing that the grains of the water-bearing medium though not normally considered as compressible are elastic and that according to the change of the hydrostatic pressure beneath, the ground in the neighbourhood undergoes actual subsidence when a bore is open and re-elevation when the bore is closed (5). According to this theory the subsidence forces out the accumulation of the water and reduces the size of pores, the reduction tending to lessen the rate of flow; further when the bore is closed the static pressure increases and again tends to elevate the ground. The

(1) Beadnell. *An Egyptian Oasis*. p. 148.

(2) Grabham. *Notes on Some Recent Contributions to the study of Desert Water Supplies*. Cairo. *Scient. Journ* Vol. 4. 1910. pp. 166 — 174.

(3) The static head is the limit to which the artesian water rises in a well.

(4) Grabham. *Waters of Kharga*. Cairo. *Scient. Journ* Vol. 5. 1911. p. 246.

(5) Grabham. *Notes on Some Recent Contributions to the Study of Desert Water Supplies*. Cairo. *Scient. Journ* Vol. 4. 1910. p. 166.

pores would, then, regain their normal size and their capacity for holding water increases.

Measurement of the Water.

As soon as a well has been sunk and the first rush of water has subsided to its steady flow, the output of the well is measured in order that the tax, to be levied on the well may be fixed⁽¹⁾. The apparatus⁽²⁾ used for this purpose is primitive, consisting of the following :

- 1— A wooden peg.
- 2— A measuring rule divided into eight equal parts.
- 3— Several weir boards each of which is, in length, multiple of the eight divisions of the measuring rule

After the hole-bore has been examined to make sure that it has not been temporarily plugged to reduce the flow and consequently the tax, the portion of the water channel nearest the well is made as even as possible so as to get a smooth flow of the water. The wooden peg is then driven into the bed of the stream until its top is level with the water surface. A weir board is then chosen of such a length that when it is placed horizontally across the stream, all the water will flow through the notch without its surface level being raised above the top of the peg already referred to. Next the measuring rule is wetted, dipped in fine sand until it is covered with it, and then placed vertically on the bottom of the notch. A moment's emersion washes away the sand, and in this manner the depth of the water is conveniently read by counting the divisions on the rule left uncovered by the washing away of the sand. To obtain the discharge in "Kirat" which is the unit known to the people, the width of the notch is multiplied by the depth of the water over the bottom of the notch.

(1) This applies only to Dinkla and Kharga where the tax is levied on the water supply. In the other oases the water supply is not measured.

(2) The apparatus has been modernised, being made of iron and brass and consisting of one weir which has a sliding end.

The method has been described by Ball⁽¹⁾ Beadnell⁽²⁾ and Buckley⁽³⁾ and condemned by them all as unscientific and inaccurate. According to them the most important defects are that no account is taken of the velocity of the stream and no provision is made for the free fall of the water over the notch. It is quite obvious that the neglect of a proper fall over the notch is a serious defect, for if there were no actual flow at all, the method employed would still indicate a discharge. It is doubtful whether this defect has originated with the method itself or whether it is simply the result of corruption caused by the long time during which the method has been in use⁽⁴⁾.

Coming now to the figure given as the discharge of the well in 'Kirat' we find that it simply represents the sectional area of the stream in aquare units. If this is multiplied by the velocity of the water in the stream, then the real discharge of the well can be obtained. The "kirat" as it is known in the oases might represent, under one condition, a measure for comparing different discharges and this could only be if the velocities of all the streams at the time of measurement were the same.

Volume of Water utilised in the Oases.

The available records give us the discharge of wells in Dakhla and Kharga in terms of the kirat which unit has no uniform value. In Dakhla its value may be anything from 25 to 197 litres per minute, while in Kharga it may be 110 litres or even as high as 290 litres per minute.

Some experiments have been made for determining the value of the kirat, and accurate methods were employed. In the following list are recorded the average values of the kirat

(1) Ball. Kharga Oasis. Appendix, B. pp. 108—111.

(2) Beadnell. Dakhla Oasis. pp. 25—28.

(3) Buckley. Report on the Oasis of Dakhla. pp. 120—125.

(4) The writer is rather inclined to believe that this defect has been the result of corruption in the method.

in litres per minute and the approximate volume of water discharged by the wells for each of the villages of Dakhla.

	Average Value ⁽¹⁾ of Kirat in litres	No. of Kirats ⁽²⁾ recorded	Total Volume in litres
Qasr	94	442	41,548 l.p.m.
Budkhulu	101	106	10,706 „
Gedida	60	114	6,840 „
Mushia	61	106	6,466 „
Qalamon	103	210	21,630 „
Hindaw	129	248	31,992 „
Rashda	178	107	18,511 „
Masara	90	223	20,070 „
Sment	119	106	12,614 „
Balat & Tenida	117	520	60,840 „
Mut	60	166	9,960 „
Total			231,177 „
			(13,7 l.p.m. per head)

In Kharga the average value of the kirat comes to 110⁽³⁾ litres per minute while the number of kirats recorded is 1214⁽⁴⁾. The approximate discharge of the oasis wells is therefore about 146,251 litres per minute (i.e. 17 l.p.m. per person).

In Baharia, as taxes are not levied on the water supply, but on the cultivated land, records for the estimation of the discharge of wells are absent. Instead the area under cultiva-

(1) Buckley, Report on the Oasis of Dakhla, pp. 128—130.

(2) Figures recorded for the year 1936 and supplied by the Chief of Accounts, F.A. of Egypt.

(3) Buckley, Report on the Oasis of Dakhla, p. 127.

(4) Recorded for the year 1936 and supplied by the Chief of Accounts, F.A. of Egypt.

tion is accurately recorded in feddans⁽¹⁾. It was found by actual measurement that the amount of water required to irrigate one feddan of wheat, barley or palms is 25.5 litres per minute.

Accordingly the following list gives us a rough estimate of the water volume consumed in Baharia for irrigation purposes :

Bawitti .	474 feddans ⁽¹⁾	X 25.5 = 11,987 litres per minute.
Mandisha	518 "	X 25.5 = 13,109 "
Qasr . .	408 "	X 25.5 = 10,404 "
Zabbo. :	208 "	X 25.5 = 6,404 "
		<hr/> Total 41,940

(i.e. 7.2 litres per minute per head)

In the same manner a rough estimate of the water utilised in Farafra would be 4,049 litres per minute (i.e. 7.3 l.m.p. per head.) and in Siwa about 40,800 litres per minute (i.e. 10.7 l.p.m. per head).

The water discharged from all the oasis wells would therefore be about 464,181 gallons per minute (i.e. 13 l.m.p. per head).

From the above we can arrange the oases as far as the volume of water discharged by wells is concerned, in the following order : Dakhla, Kharga, Baharia, Siwa and Farafra. But when we consider the average amount discharged for each individual of the population Kharga² comes first followed by Dakhla, then Siwa, while Baharia and Farafra come last. This does not necessarily indicate that Kharga is more flourishing than Dakhla, nor is Siwa than Baharia, because the discharge of a well does not mean that every drop of its water is properly utilised. We cannot, therefore, take the discharge of wells as a standard with which to judge the prosperity of the oases.

(1) A feddan or Egyptian acre contains 4200.833 square metres and corresponds to one English acre and six rods.

(2) Figures representing the number of feddans are quoted from the Registers of Taxation for 1936.

D. Is There a Diminution in the Water-Supply ?

Mutual Interference of Wells.

In the years 1908 and 1909 Beadnell published brief accounts⁽¹⁾ of the flowing wells in Kharga Oasis which were subsequently embodied in a more extended account⁽²⁾ of the district. An important feature of these publications is the accounts of experiments on the mutual interference of wells. The most marked example he gives is the case of two bores at Sherika situated about 600 metres apart. Bore No. 5 whose outlet was nearly two metres lower than the other's, was shut down for twelve hours and the hourly observations were recorded as follows⁽³⁾ :

Bore No. 5, closed at 7 p.m. June 12, 1907		Bore No. 5 opened at 7 a.m. June 13, 1907	
Time	Discharge of Bore No. 6	Time	Discharge of Bore No. 6
7.0 p.m.	61.2	7.0 a.m.	83.7
8.15 "	65.6	8.0 "	78.4
9.0 "	68.4	9.0 "	75.0
10.0 "	69.6	10.0 "	73.0
11.0 "	73.2	11.0 "	70.8
12.0 m'night	74.7	12.0 noon	69.6
1.0 a.m.	76.6	1.0 p.m.	69.0
2.30 "	77.4	2.0 "	67.7
3.0 "	79.2	3.0 "	66.8
4.0 "	79.7	4.0 "	66.2
5.0 "	82.1	5.0 "	66.6
6.0 "	83.1	6.0 "	65.3
		7.0 "	64.0

(1) Beadnell, Flowing wells and sub-surface water in Kharga Oasis. *Geol. Mag.* Vol. 5, 1908 pp. 49 — 57 and 102 — 108.

Beadnell, Mutual Interference of Artesian Wells. *Geol. Mag.* Vol. 6, 1909, pp. 23 — 26.

Beadnell, The Underground water of the oasis of Kharga. *Cairo Sci. Journ.* vol. 5, 1911, pp. 1 — 8.

(2) Beadnell, *An Egyptian Oasis*, Chapter 10.

(3) *Ibid.* p. 145.

From the figures he was able to prove that the opening or closing of the lower well produced a most marked effect on the neighbouring well within the short space of sixty minutes, though the intervening distance was 600 metres. To those who are acquainted with the very slow movement of water through pores of sandstone such interference would seem very rapid. In Mr. Beadnell's opinion this rapidity is unconceivable without the existence in the water bearing strata of fissures and fractures which serve as direct means of communication between the two wells⁽¹⁾.

The people of the oases are aware of the mutual interference of wells, and they know for certain that wells at low levels take the water from the higher ones. The Romans too, and even the Ancient Egyptians, seem to have known it, because they did not dig wells in low lying land. They placed their wells on the highest part of the area to be irrigated, and the water flowed down to the lower ground around them.

Since the introduction of boring plant by Aymé Bey,⁽²⁾ the French engineer, about 1824, much indiscriminate boring has been carried out, and many of the new wells were bored in low lying ground so that they provided an easier way of escape for the artesian water and brought about a lowering of the static head over sometimes a considerable area. The discharge of many of the old wells diminished considerably and therefore some of these were allowed to become sanded up and are now dry.

In Kharga when Ain El-Sherkh (Ain El-Sabakha) was bored about the year 1908 the water supply from the following wells diminished considerably⁽³⁾.

Bir Saada 1100 metres distant.

Ain El Gedida . . . 1100 " " "

(1) Beadnell. Mutual Interference of Wells. Geol. Mag. vol. 6, 1909, p. 25.

(2) Shaffic Pasha. Notes on the Egyptian Oases and the Western Desert. (in Arabic) p. 60.

(3) Little. Report on Investigation of the Water Supply of Kharga and Dakhla. 1930. p. 5.

Bir El Helwa . . .	1100 metres distant .
Ain Un El Ghilan. .	750 " "
Ain Abu El Fath . .	750 " "

This killed between 1000 and 1500 trees, and about 60 feddans of high ground around these wells ran out of cultivation. Many of those people whose date palms were destroyed had to emigrate from the oasis. Sheikh Ismail, the headman of boring operations in Kharga Oasis, reports that when Bir El Daba was bored in Beni, it yielded 13 kirats but reduced the flow in the following wells⁽¹⁾ :

Ain El Tarfai from 9	to 6	kirats.
Ain El Qasr "	5½ to 5¼	"
Ain El Qadr "	6 to 4½	"
Ain Salem "	4 to 3	"

The total decrease was from 24½ kirats to 18½ kirats or 5½ kirat but as the old well yielded 13 kirats there was a net gain of 7½ kirats.

These examples from Kharga show how wells bored on low ground decreased the flow from neighbouring wells on higher ground, though in some instances there is an increase in the total water supply.

The same thing has happened on a large scale in Dakhla, where the water supply of the village of Mut has been reduced by the wells bored in Hindaw 7½ Km. to the north, the static head at Mut having been lowered about five metres⁽²⁾.

Irrigation at Mut now depends almost entirely on Sakias which raise the water. A few wells have been kept flowing by deepening the water channels, as the level of the water fell. This entails a large amount of labour not only to deepen the channels but to keep them clear of the earth which is continually falling in.

Ain El Gadia, for example, gave over 15 kirats by free flow, but the water is now about five metres below ground

(1) Little, Report on Investigation of the water supply of Kharga and Dakhla, 1930. p. 6.

(2) Ibid. p. 6.

level. There is no sakia at the well but there is sufficient water in it to supply two sakias. Ain El Balad now gives $1\frac{1}{2}$ kirats, lifted by sakia from a depth of four metres. Ain Bashia gives two kirats by free flow, the channel being over five metres below the level to which the water formerly rose.

The contrast at Hindaw is remarkable⁽¹⁾. There the water charged with gas, bubbles up and so much is available that some of it runs to waste and forms swamps in the low ground, where mosquitoes breed freely. Ain Zawia gave 10¹ kirats when first bored, but as it has been built up so that the level of the water has been raised about a metre above the ground it now discharges 8 kirats.

The water level at Qalamon, Gedida, Mushia and Qasi has also been lowered from four to six metres and the wells are worked by sakias or the water drawn off by deep trenches⁽²⁾. With either of these methods the discharge is frequently only $\frac{1}{3}$ to $\frac{1}{2}$ of what it was when the wells flowed freely at the higher level.

The Omda of Budkhulu states that it is the wells of Rashda which have lowered the water level in his village. He adds that 10,000 feddans have gone out of cultivation and that the number of palm trees in his village has considerably decreased. His statements are in part correct as a large amount of the loss of water in his village as well as in the others is due to the level having been lowered by new wells bored at Rashda and Hindaw⁽³⁾.

No Real Decrease in the Water-Supply.

The fact that many wells have ceased to flow, and the water level in them has fallen as much as five metres while the output of other wells has decreased considerably and a

(1) Little. Report on Investigation of Water supply of Kharga and Dakhia, p. 7.

(2) Ibid. p. 8.

(3) Little. Prelim. Report on the water supply of Kharga and Dakhia, 1932, p. 12.

large amount of land that was formerly under cultivation has had to be abandoned, has led to a prevalent idea amongst the inhabitants of the oases that their water supply is less than formerly.

There is no doubt that such villages as Mut, Qalamon, Budkhulu and Mushia have lost much of their water supply, but this does not mean that the whole supply of Dakhla Oasis, where they lie, has decreased. The lowering of the static head in these villages, and accordingly the decrease in their water supply, has been brought about by the boring of new wells in low lying districts, and these as a rule have a big discharge.

The following figures, quoted from Little's report⁽¹⁾, show in a decisive way that there is in Dakhla a great increase in the volume of water discharged from the wells as a whole and that there is now in the oases more water than formerly.

Year	Wells	Increase	%	Discharge	Increase	%	Average Yield
1900	577			1096 K.	—		1.9 K. per well
1925	872	295	45	2224.6 K	1128.6K.	103	2.55 K. per well

The number of wells increased between 1900 and 1925 from 577 to 872 which is an increase of 45% and the total discharge from 1096 to 2224.6 kirats, an increase of 103%.

The average discharge of the wells in 1900 was 1.9 kirats per well and the average for the new wells bored between 1900 and 1925 was double this, namely 4 kirats per well. Therefore the real increase of discharge during the twenty-five years was probably much more than 103%. This means that the total discharge in Dakhla was more than twice as much in 1925 as in 1900. This great increase in output, coupled with the fact that many new wells were bored at low levels during this period, produced a lowering in the level of the static head. The effect of this was felt principally in the

(1) Little Report on Investigation of the Water Supply of Kharga and Dakhla. 1930. p. 14.

older villages, where there were numerous wells and where the ground level was about 105 metres or more, and it gave the impression that the water supply was gradually decreasing although actually it was increasing.

Beris can be taken as an example to show that the water supply of Kharga Oasis as a whole has also increased⁽¹⁾

Year	Wells	Increase	%
1923	112		
1930	187	75	67

The total output from all the wells of Beris in 1923, was 112 kirats. In 1930 two old wells were cleaned and gave 57 kirats and 18 kirats respectively. The combined output of these two wells is equal to 67% of the total output of Beris in 1923.

In the other oases the water-supply is more than the needs of the inhabitants and there are no complaints that it is decreasing. In fact it is also increasing as a result of the boring of new well.

E. The Conservation and Development of Supplies.

The quantity of water which the Nubian Sandstone can furnish and hence its value as a source of water supply depends on its porosity. It must be remembered that large pores and high porosity do not necessarily go together, and that small pores in a rock frequently accompany high holding capacity. For instance, a fine grained sample will absorb from 25 to 28 per cent of water, a medium grained sample 20 per cent, while a coarse sample may take up as little as 15 per cent.⁽²⁾ The pores and transporting capacity of the coarse grained variety will, however, be very much greater than in the case of either of the others.

In order to arrive at some idea of the water-bearing capacity of the strata from which artesian water of the oases is obtained,

(1) Little, Prelim. Report on the Water Supply of Kharga and Dakhla Oases, 1932, p. 11.

(2) Beadnell, *An Egyptian Oasis*, p. 151.

Beadnell made an examination of many samples of Nubian Sandstone brought up to him by boring machines in Kharga. The average porosity of 64 samples was found to be 19.45 per cent.⁽¹⁾ but as the samples available were all in powder form, owing to the methods of drilling employed, this figure does not represent the porosity of the solid rock. The latter has been ascertained by Beadnell to be 5 per cent lower than that of loose sand. It is therefore fairly accurate to give 15.45 as an average percentage for the porosity of the consolidated Nubian Sandstone⁽²⁾.

It has been calculated that a layer of sandstone ten feet thick and with ten per cent porosity will hold in its pores 270 000 gallons of water per acre⁽³⁾. In Kharga, where the thickness of the artesian water strata is estimated at 120 metres⁽⁴⁾ and its porosity at 15.45 per cent, the holding capacity of the Nubian Sandstone would be 170 million gallons per acre. In Dakhla where the thickness of the rock is 122 metres,⁽⁵⁾ the capacity would be similar to that in Kharga. When we remember, then that the Nubian sandstone extends, not only under the floor of the oases, but also under the whole area of the Libyan Desert, we realise the large amount of water which is kept in store underground.

It is rather difficult to attempt to give an estimate of the volumes of water which can be withdrawn from the oasis wells without exhausting the water bearing strata. The old wells are known to have been flowing since the time of the Ancient Egyptians; the quantity of water which they discharge at present, though less than what it used to be in former days, is still large and this indicates that the strata are still fully saturated.

(1) Ibid. p. 151.

(2) Dixey states that a porosity of less than 5 per cent is regarded as low, and one greater than 20 per cent as high. p. 153. *A Practical Handbook of Water Supply*.

(3) Dixey *A Practical Handbook of Water Supply*. p. 154.

(4) Beadnell. *An Egyptian Oasis*. p. 48.

(5) Beadnell. *Dakhla Oasis*. p. 92.

In 1905 Beadnell stated that the underground artesian water supply of Kharga being so inexhaustible, the output at the surface may be almost indefinitely augmented provided the wells are sunk at suitable localities and kept sufficiently far apart to avoid any appreciable reduction of hydrostatic pressure⁽¹⁾. But the history of the Corporation of Western Egypt (in Kharga) subsequent to 1900 indicates that too much exploitation of the water supply would exhaust the strata and lead to disastrous consequences⁽²⁾. In 1910 forty-five bores had been sunk, nearly all being reported as giving water. In 1912 a report indicated that although in cases where pumping operations were carried on the artesian flows of these wells were increased, other wells in the neighbourhood were adversely affected⁽³⁾.

What is to be done.

In order not to incur any damage to the water supply of the oases, the following suggestions have to be carefully considered.

- 1 - Sites of wells should be carefully chosen in such a way that they may not affect neighbouring wells
- 2 Water flowing from the wells should be stopped from running to waste.
- 3— Seepage from wells into the adjoining strata should be stopped.

Siting of Wells.

The relationship between the level of the ground and the static head of the underground water is of great importance as it decides whether artesian or sub-artesian conditions prevail. With few exceptions the sites of the oasis' wells are, in fact,

(1) Beadnell. Report upon the Water Supply of the Western Oases, in Annual Reports of the Corporation of Western Egypt. (1905) p. 11

(2) Annual Reports. Files of the Corporation of Western Egypt.

(3) The wells were not sufficiently apart and the area where they were bored was not favourable for boring.

lower than the static head, that is the reason why the water flows freely from them without any need of lifting appliances. In some places the ground level is so low, that if extra open pipes are fixed into the pipe of the well, the water will rise to a considerable height. In such localities the hydrostatic pressure is high enough to push up large volumes of water from the wells. In Rashda, Bir El Magnoon (94.45 metres above sea-level) which is 15 metres lower than the static head of Dakhla underground water, discharges about 2800 litres of water per minute, while in Beris, Ain Ramah (35.92 m. above sea-level) which is 30 metres lower than Kharga static head yields about 6000 litres per minute.

In other places where the ground level is higher than the static head, the water stops in the bores at varying depths from the outlet and has to be raised by lifting machines. In Mut, Budkhulu, Mushia, and Gedida, water is from 5 to 8 metres lower than the outlet of wells, and the lifting appliances used are sakias, shadufs and pumps. Since artesian conditions are of great economic advantage in that they obviate the cost of pumping, rigorous measures have to be taken to stop any fall in the static head of the underground water. It has been noticed that the boring of new wells or the clearing out of old ones in low-lying areas lowers the water level of the high wells in the vicinity. It is, therefore, necessary that an accurate plan should be devised for any further developments of the water supply of the oases. As a first step towards the solution of the problem, the authorities have, in recent years, prevented the injudicious sinking of the new wells to which Beadnell called attention in 1901, when he suggested that a competent official with a sound knowledge of levelling should be appointed to superintend all boring operations⁽¹⁾. But unfortunately, the officials of the oases have no method of knowing the levels or even of determining the relative levels of two wells. They attempt to do the latter by eye and also by looking for a point where a water channel from one well runs close to a channel from the other well and observing the

(1) Beadnell. Dakhla Oasis. pp. 28 — 31.

difference between the level of the water in each. In 1926 when Little was asked to report on the water supply of Kharga and Dakhla, he suggested that the level of the oases wells should be fixed by actual measurements taken with reliable instruments⁽¹⁾. This has been carried out by the Survey Department of Egypt which has recorded the levels of all the wells in Siwa, Kharga, and Dakhla, and published them in pamphlet form⁽²⁾. In dealing with any application for permission to clean any well, its level can be easily compared with the levels of other wells in the vicinity, and if it is found to be so high that it cannot affect the discharge of any other well, permission may be granted, otherwise it is refused. The following is an actual example to show how the comparison can be carried out.

The owners of Ain El Agula at Qalamon (Dakhla) asked for permission to clean their well. All the wells in the surrounding area, with the exception of one were found to be between one and two kilometres from it, and their levels as recorded by the Survey Department were as follows⁽³⁾ :

	Distance from the well	Level above Sea-level
Ain Abu Osman	900 m.	98.93 m.
Bir Ain El Saada	1240 m.	101.91 m.
Bir Ain Um El Hasab El Kadim	1630 m.	105.31 m.
Bir Ain El Rakha El Rabia	1770 m.	102.49 m.
Bir Mohamed Ghetas	1790 m.	101.21 m.
Bir Ain El Sharabati El Gadid	1950 m.	101.71 m.
Ain El Sohsah	1960 m.	96.67 m.
Bir Ain Musbah	1980 m.	99.81 m.

(1) Little. Report on Investigation of the Water Supply of Kharga and Dakhla. 1930.

(2) Little. Prelim. Report on the Water Supply of Kharga and Dakhla Oases. 1932.

(3) a. Names and Levels of Springs and Wells in Siwa Oasis. Survey Department of Egypt, 1931.

b. Names and Levels of Springs and Wells in Kharga and Dakhla Oases. Survey Dept. of Egypt. 1931 (in Arabic).

(3) Little. Prelim. Report on the Water Supply of Kharga and Dakhla. 1932. p. 44.

In the lowest of these wells the water level was 96.67 m. above sea level and in the highest it was 105.31 and they were all higher than the level of Ain El Agula itself (96.5) and would be affected if it were cleared. Ain El Agula was also lower than a number of wells at Rashda and if it were cleaned it would probably damage some of these wells as well as those of Quamon and Budkhulu. Permission to clean the well was, therefore, refused.

Arrest of Surface Wastage and Underground Seepage

It was once suggested that all the wells of the oases should be fitted with taps, which would enable a full control over the discharge of wells. When the water is not needed by the farmer the well could be closed and the water could then be saved from flowing into the marshes and salt lakes which cover the lower parts of the oasis floor. But the suggestion had to be abandoned owing to the fact that the wells are not properly cased. The water-bearing sandstone in which the wells are sunk contains alum, magnesium sulphate, and iron pyrites, and the water corrodes iron pipes rapidly.⁽¹⁾ Wooden pipes made from Sunt (Acacia) and Dom Palm which have excellent lasting properties have been used by the natives but these also are liable to leak at the joints. Hamdy Eff reports that the leakage of water through the pipes whether iron or wooden wastes about 90% of the water supply of Kharga Oasis.⁽²⁾ Though there is much exaggeration in this statement, the fact remains that a great proportion of the water is lost in this way. Many of the wells marked on the maps are now dry and have been so for a long time. These have been sanded up at the top by the accumulation of mineral deposits, growth of plants and drifting of sands at the higher part of the bore. The rest of the bore, is, in most cases, full of water, which when impeded by plugging, seep through the adjacent beds. Ain Ramah (Kharga) which dis-

(1) Buckley. Report on Dakhla Oasis. p. 113.

(2) Hamdy Eff. Report on the Water Supply of Kharga. 1926. p. 7.

charges 6000 litres⁽¹⁾ per minute was a dry well for a long time. When it was being re opened in 1930, digging that was carried out to a depth of 30 metres only had to be stopped⁽²⁾ as water forced its way up in great profusion.

The plugging and reconditioning of the old wells is expensive particularly in Kharga where the bores pass through a great thickness of alternating sandstones, clays and shales. At the request of the Frontier Administration Bir Ain El Sheikh was plugged by the Department of Mines in 1923 and this operation cost 223 Egyptian pounds⁽³⁾. In order not to incur any damage in future, wooden pipes should not be used. Pipes of non-corrosive material would be a great improvement, but the question of cost militates against their use. If pipes suitable for casing the bores would be cast in one of the new types of cement, preferably near the site of the bore, it would possibly be one of the cheapest methods of overcoming the corrosion of the pipes. There would still remain the probability that in many wells, the pipes would eventually become choked by the slow deposition of ferruginous salts inside them and this would involve periodical cleaning.

Following the lines of this argument, it would be wise, I believe, to limit any further development of water exploitation to two grades which could be carried out in the order given below :

1— *Cleaning the already established wells.*

This is enough to double the volume of water discharged at present.

2— *Reopening the old extinct wells.*

These are reasonably distant from each other and their level being high would not affect the other wells nearby.

(1) Little. Preliminary Report on the Water Supply of Dakhla and Kharga, 1932, p. 22.

(2) Ibid. p. 21.

(3) Little. Files of the Frontier Administration. Letter addressed to the Director of F.A. in answer to a correspondence dated 2. 11. 33.

Moreover, the land around them, having been once under cultivation is not as sterile as the virgin soil which has never been cultivated, therefore it does not need any reclamitive work.

It is only with the accomplishment of this necessary procedure that new wells should be sunk and then only in close proximity to first class land.

II. Origin of the Artesian Water.

The origin of the artesian water supplies of the Egyptian Oases is a controversial question. Many theories have been put forward to account for its presence; but they appear to be founded principally on conjecture, for no convincing evidence has yet been produced to support any theory advanced.

Some geologists think that waters of the oases are derived from the rainfall in the Sudan flowing underground in the permeable beds of the Nubian Sandstone, while others believe that they are merely Nile waters which have penetrated into the adjoining deserts.

Ball is against the view that the artesian water of the oases is derived from the Nile, because the levels of some wells and springs in the Libyan Desert are according to him higher than the level of the Nile⁽¹⁾.

A. Ball's Theory.

In 1925 Dr. Ball determined the levels of a number of water sources in the Libyan Desert and found that Merga lake with a level of 500 m. above sea-level was higher in altitude than any point in the course of the Nile up to Bahr El Gazal⁽²⁾.

With the levels of three water sources, Ball determined the inclination of the plane which represented the static head of the underground water⁽³⁾. If this plane is extended in any

(1) Ball Problems of the Libyan Desert G. J. Vol. 70, 1927 p. 105

(2) Ibid. p. 105.

(3) Ibid. p. 106.

direction he found it coincides in fairly close approximation to the level of the other sources in the area. This made him believe that there is, under the large area of the Libyan Desert, a continuous sheet of underground water⁽¹⁾, from which all the desert supplies are derived. In other words he believes that the Libyan Desert forms a single artesian basin

Encouraged by his results, Ball attempted to construct a map showing in contour lines the static head of the artesian water or in other words, the level to which the artesian water could rise if it is tapped⁽²⁾. But it seems that when he was preparing his map, Ball was guided by the inclination he had already established. This is the only way in which with the levels of 30 points⁽³⁾, he could cover the vast area of the Libyan Desert with many 100 metre contour lines of the static head, which in their slope were found to coincide more or less with it⁽⁴⁾. Following the slope of the contour lines upwards, Ball came to the conclusion that the origin of the water supply of this large basin is somewhere in the Erid-Ennedi Region, and not from the Nile⁽⁵⁾.

The Libyan Desert as a single Artesian Basin

Consideration of the whole Libyan Desert as a single artesian basin brings us to a controversial question, namely the relationship of the crystalline rocks and the Nubian Sandstone. South of Kharga Oasis there are several places where crystalline rock crops out from beneath the Nubian Sandstone. If these inliers which occur in lines are to be regarded as due to orogenic movements and representing the axis of anticlinal folds⁽⁶⁾ as Captain Lyons and Hume would suppose, the possibility of a barrier of impermeable rock effectively cutting any direct underflow must be borne in mind

(1) This is the sheet which feeds the oasis wells.

(2) Ball, Problems of the Libyan Desert. G. J. V 1. 70 1927 p. 107.

(3) For a list of these points see — Ibid. p. 114.

(4) Ibid. p. 116.

(5) Ibid. p. 116.

(6) See Grabham, Notes on Some Recent Contributions to the Study of Desert Water Supplies. Cairo. Sci. Journ. vol. 4, 1910. p. 173

Similar inliers of fundamental rock show themselves on a larger scale in the region of Owenat, attaining great heights and extending in different directions. With the existence of such inliers coupled with our knowledge of the folding and faulting to which large areas of the Libyan Desert have been subjected, one is rather inclined to consider the Libyan Desert as composed of several artesian basins than to regard it as one large basin.

There is more than one water-bearing stratum

The Libyan Desert may be simple in structure and uniform in character as far as its formations from the Eocene onwards are concerned. As to the Nubian Sandstone, there is unanimous agreement among the geologists that it varies a great deal. It is much false bedded and the impermeable clay and shale layers which are responsible for the existence of the artesian conditions within it are not continuous. When water is entrapped between any two of these impermeable beds it develops into an artesian reservoir. The water-bearing beds are many and they may exist one over the other, each of which when tapped causes the outflow of the water at a certain level, that may be different from that of the water issuing from another stratum. In Nakhlai, Walpole of the Desert Survey of Egypt notices two different water levels one being higher than the other⁽¹⁾. In northern Kharga, Beadnell states that there are two distinct water-bearing sandstone strata separated by a 75 metre band of impermeable grey shale⁽²⁾. The upper bed, designated by him "the surface water sandstone" is exposed at the surface, and contains sub-artesian water, while the lower from which the flowing wells derive their supplies, never approaches within 80 metres of the surface, and forms the true artesian water sandstone.

Correlation of the Water-bearing strata in Dakhla and Kharga.

In Dakhla the water-supply is derived from a bed of white

(1) Walpole. The South Western Desert. Bull. Soc. Roy. de Geogr. D'Egypte. (1936) p. 259.

(2) Beadnell. An Egyptian Oasis. p. 125.

sandstone which has a limited thickness of 122 metres.⁽¹⁾ It is overlain by a bed of red clay the upper part of which is a conspicuous feature throughout the oasis, and is underlain by another clay of black colour and of great tenacity. In order to correlate the water-bearing sandstone of Dakhla and Kharga the following figures are quoted⁽²⁾.

<i>In Kharga⁽³⁾</i>		<i>In Dakhla⁽⁴⁾</i>	
Phosphate beds	70 m	Phosphate beds	18 m
Purple shales	50 m.	Red Clay	48 m.
Surface Water sandstone	45 m	White sandstone	122 m
Impermeable grey shale	75 m	Black clay Thickness unknown	
Artesian water sandstone	120.		

Allowing for differences in the thickness of the beds, the purple shales of Kharga correspond to the red clay of Dakhla, the surface water sandstone of Kharga represents the white (water-bearing) sandstone of Dakhla, though the latter is much thicker, and the impermeable grey shales are equivalent to the black clay of Dakhla which has not yet been pierced by the drill. This correlation, showing how the water of Dakhla is derived from a series of Nubian Sandstone quite different from that which feeds Kharga wells, does not correspond with Ball's view that the water sources of the Libyan Desert are fed from one continuous sheet of underground water (Dakhla and Kharga wells are included in this statement).

It is only in Dakhla and Kharga that we can obtain information about the depth of the wells and layers passed through by the bores. The history of most of the desert wells and springs is completely unknown and the geology of the vast region between Owenat and Erbi-Ennedi on one side and between Owenat and Darfur on the other, has been collected

(1) Beadnell. Dakhla Oasis. p. 92.

(2) Little. Report on Investigation of the Water Supply of Kharga and Dakhla Oases. 1930. p. 23.

(3) Beadnell. An Egyptian Oasis. p. 31.

(4) Beadnell. Dakhla Oasis. p. 92.

during hasty motor drives and is far from complete. In the case of Merga lake, for example, nobody knows the depth from which the artesian water is derived, nor is it known, whether the water comes out from one or more layers, yet Ball believes that it takes its water from the same continuous underground water sheet which feeds all the other wells of the Libyan Desert. A thorough study of the water supply in this area is urgently needed, not only the levels and positions of wells should be fixed, but the nature of the water, fluctuations of its level and strata through which bores have been drilled, should be recorded. After we have obtained such information, by correlation of the data it might be possible to say with precision whether or not the whole Libyan Desert forms a single artesian basin.

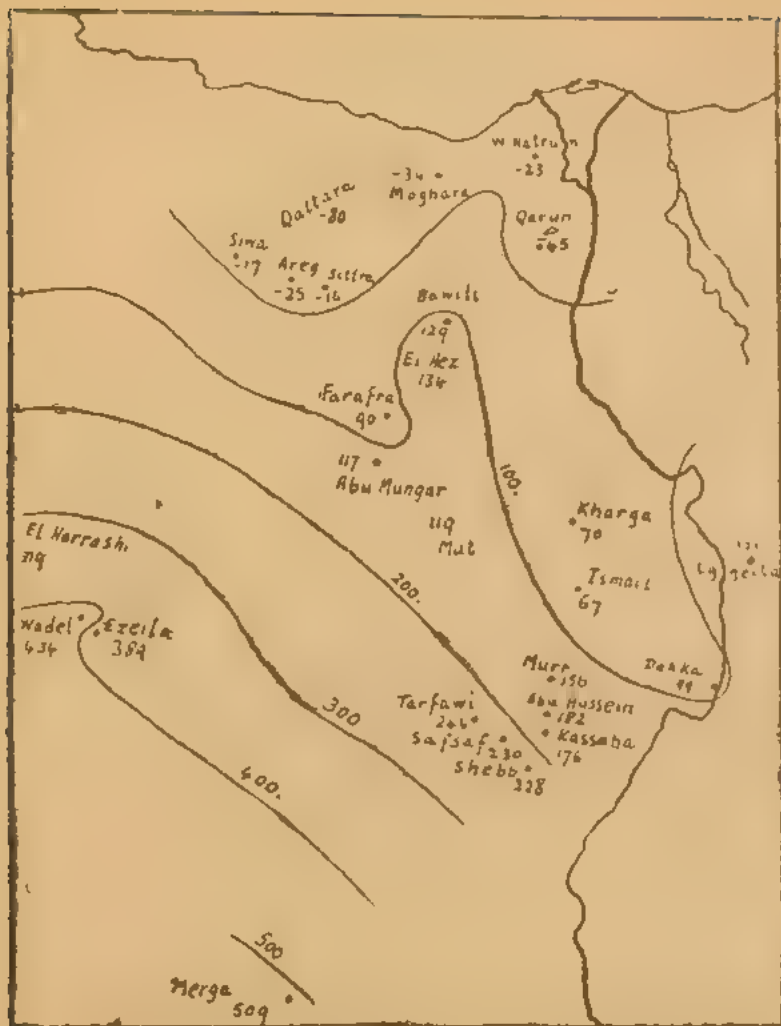
Ball's Map⁽¹⁾.

As representatives of the static head of the underground water, and the direction of its slope, perhaps the 500, 400, 300 and 200 metre contour lines are the most critical in Ball's deduction that the artesian water of the Libyan Desert has its origin in the Erdi-Ennedi Region⁽²⁾. The smoothness of their trend in a N. W. — S. E. direction shows, no doubt, that the static head is sloping upwards towards that region. But unfortunately, these four contour lines on which the solution of such a great problem as the origin of the artesian supply has been founded, are based on the levels of four fixed points only, though they cover an extensive area of almost 1,100,000 sq. km. The 500 m contour line is fixed by the level of Merga lake at one end only, the other end being interpolated. The 400 m is fixed at its N.W. end by the level of Kufra, its other end is also interpolated. The 300 m. is fixed at one end only so is the 200 m contour line. It is no wonder then, that the lines are smooth and parallel to each other.

In the area covered by these four contours, there are two other wells which have been excluded from Ball's list, as he thinks that these do not derive their water from the same water

(1) O. J. vol. 70 (1927) facing p. 96.

(2) See map on page 90.



Ball's Map.

sheet which feeds the majority of the wells of the Libyan Desert. Had the levels of these two wells been adopted with the others for plotting the contour lines of the map, Ball's theory could not have originated. Sarra⁽¹⁾ well, for instance, with a level of 400 metres above sea-level, would certainly break the smoothness of the 400 metre contour line and change the orientation of the slope of the static head.

The 100 metre contour is of a different nature, being characterised by large curves. Ball thinks that the withdrawal of large quantities of artesian water in the Nile reaches at Dakka is responsible for the curving of the line southwards to exclude the wells of Kharga⁽²⁾. Ball believes also that the same phenomenon occurs in the Qattara Region thus causing the contour line to curve southwards⁽³⁾. Are we to understand from this that the 100 m contour line, had it not been affected by the withdrawal of water at these two regions, should have extended in a NW-SE direction along that point of it which lies to the North of Bahariya². If he means this, the distance between the 200 metre and the should be 100 metre contour would, then, be disproportionate to that between any two of the other contour lines. If the same degree of inclination for the static head of the underground water as marked by the levels of Shebb, Merga and Kutra wells is to be regarded⁽⁴⁾, perhaps the parts of 100 m. contour line to the south of Kharga, Siwa and Farafra are the most inappropriately situated. The abnormality in the trend of this contour line which appears when it bulges northeastwards needs explanation and it is doubtful if Ball's theory can offer any.

(1) See Map, p. 116 G. J. vol. 70 (1927).

(2) He means by this, that the water level in Kharga is lower than it should be, though in another part of his article he refers to the same level as an ideal example to show how conformable it is both in degree and direction of inclination, with the plane which he has established for the static head of the underground water.

(3) Ball, Problems of the Libyan Desert, G. J. Vol 70, 1927 p. 115

(4) These are the three wells levels were adopted in fixing Ball's plane representing the static head of the underground water.

The Nile and the Artesian Water according to Ball

Dr. Ball not only thinks that the artesian water of the Libyan Desert is independent from the Nile but he also believes that a large quantity of it seeps into the Nile in its Nubian reaches. His evidence for this statement can be summarised as follows.

In the vicinity of Dakka⁽¹⁾ (105 kilometres south of Aswan) the lands on both sides of the river are irrigated with hot water (83° F.) drawn from pits sunk in the alluvial deposits which extend between the river and the edges of the sandstone deserts on both sides.

The water from the pits is derived from sandstone beds which underline the alluvial flats and are cut through by the Nile channel. The fact that the water derived from the pits seemed to Ball to resemble, both in temperature and character, the artesian water of the oases, made him believe that there is seepage from the water-bearing strata which feeds the oases into the Nile, at the points where it cuts through them. He says 'there can hardly be the smallest doubt that at Dakka the Nile is not only continually abstracting artesian water from the same underground sheet that feeds the oases but is abstracting it in far larger quantities than these yielded by all the oases wells and springs put together'⁽²⁾.

In order to discuss the possibility of this seepage question under the conditions Dr. Ball describes, it may be helpful to quote the figures he gives in support of his argument⁽³⁾.

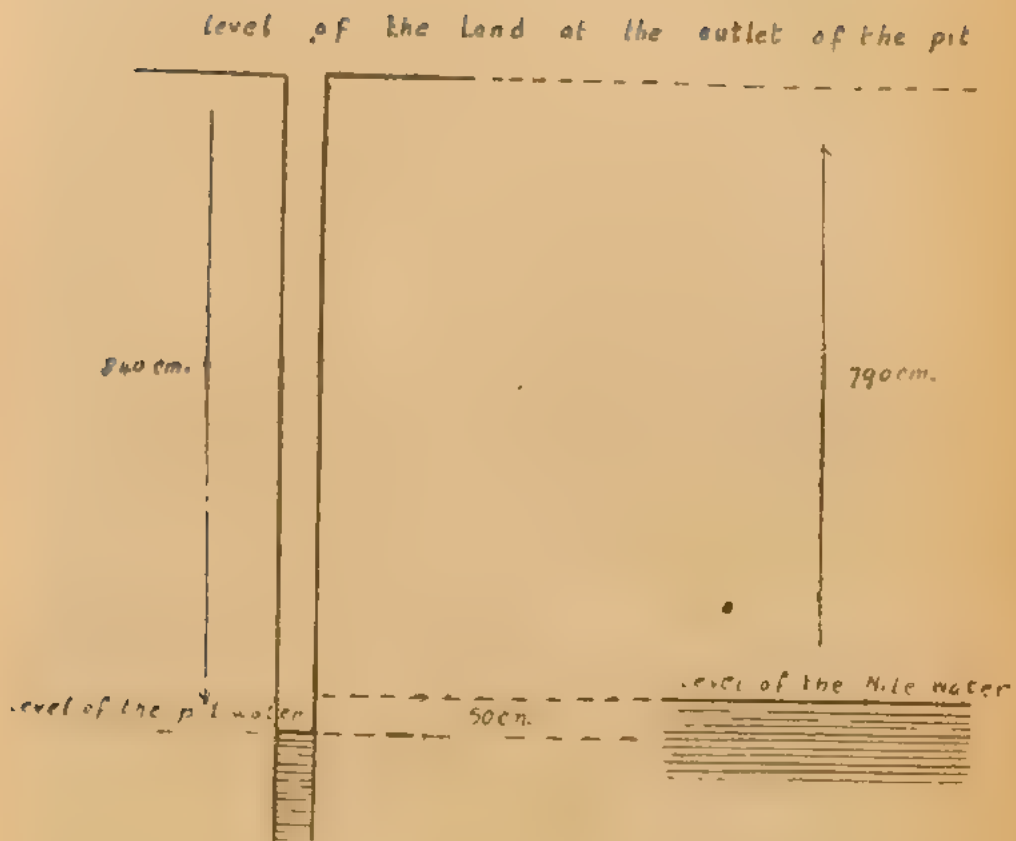
- 1 - The pit he examined was 150 metres west of the Nile
- 2 - The level of the ground was 7.0 metres above that of the Nile which was then 99 metres above sea-level
- 3 - The surface of the water in the pit was 8.4 metres below the level of the ground⁽⁴⁾.

(1) Ball, Problems of the Libyan Desert, G. J. Vol. 60 1927 p. 112

(2) Ball, Problems of the Libyan Desert, G. J. Vol. 70 1927 p. 113.

(3) Ibid. p. 112.

(4) See the diagram on page 93.



- 4 The temperature of the water in the pit was 83°F., that of the Nile was 60°F., and that of the atmosphere 67°F.

A glance at the figures representing the levels clearly shows that the static head of the artesian water as indicated by the level of the water in the pit was 50 cm. lower than that of the Nile when Ball carried out his observation⁽¹⁾, and by bearing in mind that the observations were carried out in December, that is the time when the level of the Nile was generally low⁽²⁾, it can easily be deducted that the level of the Nile during the flood season would be higher still than that of the artesian water.

According to the principles of elementary hydraulics, seepage from a level as marked by the water in the pit into the Nile which is at a higher level would be impossible. On the other hand, seepage would take place in an opposite direction, namely from the Nile into the permeable sandstones. Therefore, it is quite evident that Ball, under the circumstances he mentions, is not justified in stating that the Nile is continually abstracting enormous quantities of the artesian water.

At certain places between Khartum and Aswan, water can be seen trickling from the edges of the sandstone deserts towards the Nile⁽³⁾ but this is simply river water that penetrated through the permeable rocks when the Nile was high, now coming back when the level of the Nile has fallen. This happens when the river is low and the water table is higher than the level of the river. The underground water may then emerge and trickle back to the river as occurs between Argin and Sarra⁽⁴⁾ (20 km. north of Wady Halfa).

(1) See the sketch facing this page.

(2) At present the level of the Nile in December is generally high because it is artificially raised by closing Aswan Dam which was not built when Ball carried out his observations. For level of the Nile water see Willcocks' *The Nile in 1904*, p. 198.

(3) Lyons, *Physiography of the River Nile and its Basin*, Cairo, 1906. Chapter 7. pp. 244 — 292.

(4) *Ibid.* p. 255.

Ball was certainly tempted by the high temperature of the water issuing from the sandstone beds to form the idea that the water is derived from the same source which feeds the oases, namely the rains which fall in the Erdi-Ennedi region, thus excluding the possibility of the Nile or the great drainage channels of the Eastern desert being the origin, for he says, "We could not then account for the temperature of the water."⁽¹⁾ If we compare this temperature with that of the Nile water as recorded by Ball we find that it is much higher; but comparing it with the temperature of the Nile during the flood season, that is, at the time when the water percolates through the sandstone, the difference is found to be very small. Lyons⁽²⁾ gives us 28.1°C. (82.6°F.) as the average temperature of the water of the Nile between the first and second cataracts in August, against 83°F. as recorded by Ball for the pit water. Certainly the water is liable to lose some of its temperature during the period when it is stored in the pores of the rock, but it must be remembered that the percolation of the water takes place only when the water comes in contact with the sandstone. In the flood season the latter has been exposed to the scorching sun during the long days of summer. This would definitely raise the temperature of the water to at least 120°F.⁽³⁾ It would be fair to assume that from the time the water percolates into the sandstone to the time when it trickles back to the Nile, the water temperature would fall from 120 to 83°F.

*B. Relationship between the Nile and the Artesian water
of Kharga shown in the study of the Fluctuations in the
Discharge of Wells.*

Having shown that the Nile water seeps into the Nubian

(1) Ball. Problems of the Libyan Desert. O. J. vol. 70 1927. p. 113

(2) Lyons. Physiography of the River Nile and its Basin. Cairo, 1906.
p. 253.

(3) For a comparison between the temperature of various rocks and air see Hume, Geology of Egypt. vol. 1, Chapter 2, pp. 11 — 28.

sandstone between Khartum and Aswan it would be of great interest to know whether there is any connection between the water of the Nile and the water of the oases.

As bearing on this point a study of the fluctuations in the discharge of the oasis wells has never been thought of, perhaps because of the inconveniences to be encountered in such remote and isolated districts by scientists who are accustomed to modern conveniences. Such a study which has been neglected would have been a great help in determining the relationship between the water of the oasis wells and that of the river courses or rain catchments in the surrounding regions.

Ferrar⁽¹⁾ carried out systematic experiments on the movement of the subsoil water in the Nile Valley and was able to show how the level of the wells bored through alluvial deposits of the valley was affected by the rise of the Nile during the flood⁽²⁾. Similar experiments in the oases were impossible as they would necessitate accurate measurements of many wells hundreds of miles apart by specialists who would have to stay there for a number of years.

During a visit to Kharga, it was a mere coincidence that the writer saw Hamdy Eft., a native of Kharga who was employed by the Corporation of Western Egypt for the utilisation of land in Kharga Oasis, and discussed with him some of the problems of the water supply of the oases. Upon discussion of the question of the fluctuation in the discharge of wells and its importance as indicative of the origin of the underground water he showed much interest in the problem and put at the writer's disposal all the papers and files of the company which were still in his possession. By a happy chance a monthly record of the discharge of wells bored by the company was found. The discharge was recorded in

(1) Ferrar. The Movements of Subsoil Water in Upper Egypt. Cairo, 1911.

(2) Ferrar. The Movements of Subsoil water in Upper Egypt. Cairo Scientific Journal, vol. 3 (1909) p. 291.

gallons per minute, and being convinced of the accuracy of the measurements since they were taken by the engineers of the company, the writer examined the figures to see if they indicated any sign of fluctuations. Fluctuations in the oasis water may be expressed in the increase of the volume of water discharged by wells, the rise of the static head and the increase of the hydrostatic pressure of the artesian water.

As to the rise and fall of the static head, an experiment was carried out in Kharga on the well at the Rest House, and a series of readings were recorded. These were interpreted by Little in the form of a curve which shows an abrupt rise in the level about the middle of November⁽¹⁾. (A rise of 90 cm. was attained in three days).

As to the increase of the hydrostatic pressure Mr. Wylie states in his report⁽²⁾ on the water supply of Kharga that "It has been found in taking the static heads, that the pressure rises almost instantaneously to a certain point from which it again rises but very slowly, and continues to rise for many days" He has not fixed the time during which this rise in hydrostatic pressure took place, but the middle or the end of November seems to be the time when it began

As a result of the rise in both pressure and static head, an increase in the flow of the wells is, no doubt, expected. The data derived from Hamdy Eff's record book of gauges express this increase quite satisfactorily⁽³⁾. Bore No. 1 with a discharge of 42 gallons per minute on the 15th of October, 1908, rose to;

(1) Little Gauge Readings of the Rest House Well Kharga. 1935. Files of the Geology Department of Egypt.

(2) Wylie Engineering Department Report dated 29.11.1911 pp. 245 - 246. Files of the Corporation of Western Egypt.

Wylie. Report on the Oasis Water Supply (Kharga) dated 2.4.1912 Files of the Corporation of Western Egypt.

(3) Monthly Record of the flow of wells pp 25 - 26. Files of the Corporation of Western Egypt.

47	gallons per minute on December 15, 1908.
46.3	" " " " January 22nd, 1909.
47	" " " " February 4, 1909.
47.7	" " " " February 28th, 1909.
47.7	" " " " March 31st, 1909.
49.2	" " " " April 30th, 1909.
45	" " " " May 31st, 1909.
42	" " " " June 30th, 1909.

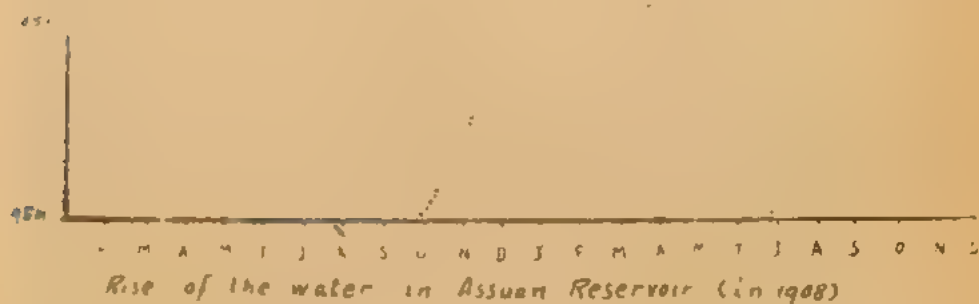
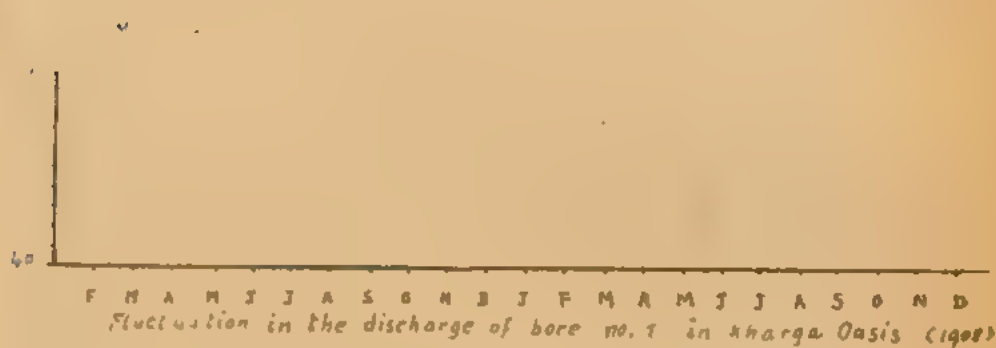
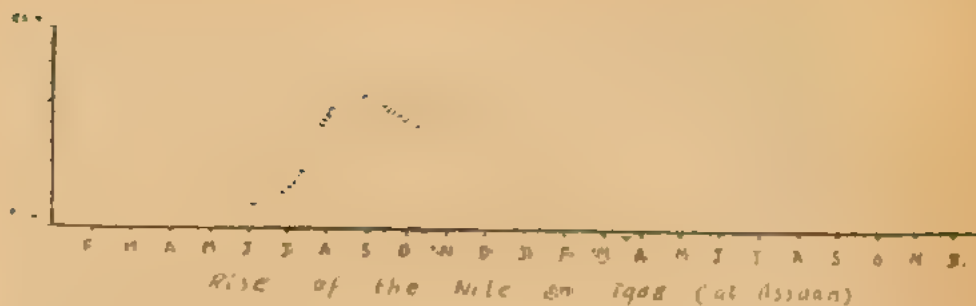
Most of the other wells bored by the Corporation in Kharga behaved in the same way, only those which were influenced by other bores in the vicinity at lower levels were excepted. The time when the flow of wells increases extends as is seen from December to the end of May⁽¹⁾. The increase in December is fairly abrupt and reflects the instantaneous rise of pressure reported by Wylie and the abrupt rise of the static head as represented by Little's curve. The increase after that continues, but very slowly, until it reaches its culminating point at the end of April then it falls again with the same abruptness as it rises⁽²⁾.

A vast portion of the Northern and Central Sudan as well as Upper Egypt have as their surface rock the Nubian Sandstone. This being the artesian water-bearing strata which feeds the oasis wells, it is a fair presumption that where the Nile traverses it or heavy rains fall upon it, much of the water is retained, and moves slowly towards the oases.

The Nile is known to rise during its flood period and as well the rains in the surrounding regions fall at specific seasons. Therefore by correlating the fluctuations in the flow of the oasis wells with the rise and fall of the Nile, or with the rainy and dry seasons of the surrounding areas, we may be able to postulate as to which of these we can attribute these fluctuations.

(1) See the curve on page 99.

(2) See the curve.



But such a correlation is not as easy as it might seem, because the movement of the underground water through the pores and fissures of the rock is so slow that the effect of a rainy season in Kordofan, for example, may not be felt in the oasis wells until a considerable time has elapsed.

We cannot attribute the fluctuations in the discharge of Kharga wells to the rains that fall in the Bahr El Ghazal Region, because the rains have two maxima which are not represented in the Kharga curve⁽¹⁾. Even if we admit that the two maxima of rainfall have been merged into one by the long distance which the water has to cover, then again we find that while rains fall for nine months in the Bahr El Ghazal Region, the increase in the flow of Kharga wells takes place for five or six months only.

The rainfall in Kordofan and Darfur seems to conform with the curve of fluctuations in Kharga, and we might be justified in thinking of it as responsible for the seasonal increase of Kharga water, were it not for the long distance which separates the two regions. This being about 1600 km is more than enough to flatten any fluctuations in the curve caused by seasonal rainfall. Moreover, the quantity of rain is not so large as to cause any fluctuations⁽²⁾.

Recent Influence of the Aswan Dam.

The fact that the fluctuations in Kharga water are prominent and regular suggests that the intake of the artesian water is not far from Kharga itself, otherwise they would be smoothed by the long distances traversed. The Nile is the nearest source of water, and its water is so abundant that it can account for the large quantities of water stored in the Nubian Sandstone. Unfortunately, the rise of the Nile covers a short period of four months⁽³⁾ which if correlated with the six

(1) See Meteorological Report. Physical Department, 1932, pp. 197-202.

(2) See Rainfall Statistics for El Obeid and El Fashir in the Meteorological Report, 1932, pp. 158—161.

(3) Lyons, Physiography of the River Nile, Cairo, 1906 plates 36 A and 36 B.

monthly seasonal fluctuations of Kharga water, would not suggest any relationship between the two. But we should not forget that the Nile in its Nubian course does not reach its highest water mark during the flood season which can be considered as a prelude for a higher level attained by the river after Aswan Dam is closed⁽¹⁾. A glance at the curves representing the rise of the Nile water in the Aswan Reservoir⁽²⁾ and the fluctuations in Kharga waters⁽³⁾ shows how closely related is each one of them to the other and the question which immediately follows is whether the rise of water in the former causes the increase in the discharge of the wells in Kharga.

The conformity of the two curves is suggestive of an answer in the affirmative, but the fact that the increase in the flow of Kharga wells is felt one month after Aswan Dam is closed, or even less than that, makes a physical connection between the two waters of the Nile and Kharga nearly impossible. There is between Kharga and the Nile a distance of about 150 m which can never be crossed by underground water in such a short time. The idea of an open underground channel which may be compared to a stream channel on the earth's surface must be dispelled. These do certainly exist in limestone rocks, but in the Nubian Sandstone water moves in the restricted pore space and crevices of the rocks.

A possible explanation for the rapid reaction felt in the Kharga wells can be sought in the flexibility of the earth's crust. When Aswan Dam is closed such a large volume of water accumulates that its weight may cause the ground to subside. Such a subsidence would certainly cause the increase in the discharge of wells noticed in Kharga.

= Willcocks. The Nile in 1904. p. 59.

Ferrar. The Movements of the Subsoil Water in Upper Egypt.
Plates 23 A, 24 A, 25 A up to 37 A.

(1) Dr. Awad. The Nile Basin (in Arabic) Cairo. 1930. p. 272.

(2) The curve represents the rise of water in the Reservoir in 1908-1909, the period during which the flow of the Kharga wells were measured.

(3) As represented by bore No. 1 at Sherika.

This does not prove any physical relationship between the two waters of Kharga and the Nile, but the fact that some of the wells,⁽¹⁾ which are known to be physically affected by the Nile, yield water similar to that of the oasis wells both in quality and temperature suggests a physical relationship between the Nile water and that of Kharga wells.

Beadnell's experiment on the interference of wells shows that the effect of one well was felt in another which was 600 m. distance from it after the short period of one hour⁽²⁾. In other words it proves that the rate of transmission in this particular area is about half-a-kilometre per hour⁽³⁾. In the light of this experiment we may be justified in believing that the water of Kharga wells is physically affected by the rise of the Nile during the flood season. It is known that the Nile begins to rise in June and July while the increase in Kharga water is felt in December and January. This gives the effect of the Nile flood about six months to be transmitted to Kharga through the fissures, fractures and pores of the Nubian Sandstone.

The fall of the Nile at the end of the flood season is not reflected in the fluctuations of Kharga wells since the water in the Aswan Reservoir still maintains a level equivalent to that of the Nile flood or even higher than it. This may explain why the fluctuations in Kharga water extend over a period of about six months whereas those of the Nile flood cover the short period of four months only.

Conclusions regarding the Origin and Permanence of the Water Supply.

Now that the relationship between the discharge of Kharga wells and the water of the river Nile has been established,

(1) Such as the sakia pit at Dakka.

(2) See p. 100 of this thesis.

(3) On page 162 of "An Egyptian Oasis" Beadnell states that one well was affected by another half a kilometre away from it one minute or two after the latter had been closed.

there can be hardly any doubt, that the Nile with its abundant and permanent supply of water provides Kharga with its underground water supply. Whether it is the sole source which feeds the oasis is hard to say. The Nubian Sandstone outcrops in many other places which are to a certain extent water catchments.

In the mountainous region of Kordofan and Darfur, as well as that of Bahr El Ghazal a large proportion of the rainfall percolates through the sand and follows the dip of the strata northwards and it is quite possible that it contributes to the underground supply. The same thing happens in the Eastern Desert of Egypt where the Nubian Sandstone⁽¹⁾ outcrops over an extensive area. In winter occasional rains fall which are known to be more frequent in the north (about the latitudes of the Egyptian Oases). This again percolates through the rock and many supplement the underground supply, helping to raise the static head.

There is another possibility in the plateau of Abyssinia where it is flanked up at its foot by the Nubian Sandstone formations. Rains there are so heavy and frequent that a contribution to the underground supply from them is quite possible.

The dividing zone which lies between the Sahara and the Libyan Desert with the Tibesti mountains as its highest part catches a certain amount of rain. This also can be taken as a possible area of contribution.

Whether the other oases of Egypt are fed from the same source of water which feeds Kharga is also difficult to say. No data which throw any light on the subject are available and the records of travellers who have in recent times visited the oases have not added much to our knowledge concerning this point.

However, by comparing the water in the five oases, we are driven by the uniformity of its characteristics and similarity

(1) Atlas of Egypt. Plates 9 and 10.

of the soluble matter contained in it, to believe that the Egyptian Oases derive their water from the same source. The only abnormality noticeable is that of Siwa and it suggests that the underground water, though derived from the same source as the other oases, is supplemented by a seepage from the coastal zone of the Mediterranean.

The fact that trickling springs have been reported to exist near the foot of the northern escarpment of Qattara⁽¹⁾ and Siwa coupled with the nature of salts deposited on the floor of the depression and their analogous character with those contained in the Miocene rocks of the Marmarican Plateau, proves that there is seepage into the depression from the north.

Forbes who made a detailed study of the water and soils of Siwa believes that its water supply is wholly dependent on seepage of rain-water from the coastal zone⁽²⁾.

It is stated that the samples of water which were taken throughout an area of about 5 to 21 miles, are surprisingly uniform in quality and the character of salts contained. This fact conforms to the opinion that these waters are derived from the nearby coastal plateau rather than from a valley underflow.

Desio who studied the geology of a part of the Qattara-Siwa depression namely Gharabub Oasis, came to the conclusion that the rains which fall on the littoral zone penetrate through the permeable arenaceous limestone of the Miocene and get enriched through their underground passage with salts which are contained in the rocks⁽³⁾. When the water appears on the floor of Gharabub it is found to be brackish as that of Siwa and similar to it in its salt contents.

While accepting both Forbes's and Desio's view that there is seepage into the depression from the northern plateau which is responsible for the brackish nature of the water and the salty character of the soil, the writer feels inclined to believe

(1) Bull. Qattara Depression G. J. Vol. 82. 1933. p. 292.

(2) Forbes — Siwa Oasis. Cairo Scientific Journal. 1921. p. 2.

(3) Desio. Risultati della Missione Alla Oasi di Gharabub. 1926. 7

that seepage from the south provides the greater part of the underground supply. Ball reports that he noticed the existence of seepage from the southern and eastern sides of Qattara at levels varying between 40 and 80 metres below sea-level⁽¹⁾.

To conclude this discussion it is justifiable to state that Siwa as the rest of the Egyptian Oases, is fed from seepage from the Nile.

The fact that the Egyptian Oases depend for their water supply on a storage which is continuously replenished by the copious and permanent water of the river Nile, explains why many of the oasis wells have been steadily flowing notwithstanding the long time during which they have been exploited. It also suggests that any further exploitation of the artesian water would not affect the supply, provided the wells, as has been suggested, are bored sufficiently wide apart.

To be contrasted with this are the conditions obtaining in the oases of the French Sahara where the underground supply is dependent on rains. Many of the wells are now failing because the water-bearing strata have been depleted. In fact the seepage into the rock from the occasional rainfall, is not sufficient to replenish the strata.

M. Mitwalli

(1) Ball, Qattara Depression O. J. vol. 182. 1933. p. 296.

PIERRE MARTYR D'ANGHIERA ET LE DROGMAN DU SULTAN GHAURI (1502)

Le 23 Décembre 1501, une galère de Venise entrait dans le Port Est d'Alexandrie, ayant à bord Pierre Martyr d'Anghiera, ambassadeur de Ferdinand d'Aragon et d'Isabelle de Castille. Il était chargé de disculper son souverain des accusations portées contre lui par les Maures, réfugiés d'Espagne, et de demander au sultan d'Egypte, Qânsûh al-Ghuri de protéger les intérêts des pèlerins en Terre Sainte.

La relation de son voyage a paru à Séville, sous le titre de "Legationis Babyloniae libri tres", 1511, 2e édition Bâle 1535, une traduction italienne fut publiée à Venise, en 1564, celle que j'utilise ici, sous le titre "Relazioni del S. Pietro Martire Milanese Delle cose notabili delle provincie dell'Egitto scritte in lingua Latina al: Sereniss. di felice memoria Re Catolico D. Fernando e D. Isabella, et hora recate nella Italiana Da Carlo PASSI. In Venetia appresso Giorgio de' Cavalli 1564. In-16°, 6 ff. (dédicace et préface de Passi) 71 ff. (texte de la relation), 6 ff. (tables des chapitres), 2 ff. (erreurs d'impression).

Voici le résumé du contenu de cet ouvrage assez rare

ff. 1 - 2, dédicace de l'auteur à SS. le Pape Léon X

ff. 3 - 10, Première Relation du voyage et ambassade auprès du sultan de Babylone, écrite par D'Anghiera aux souverains d'Espagne. Daté, Venise, 1 Octobre 1501. L'auteur vante les galères vénitiennes, qui sont des bateaux excellents et sûrs contre les Corsali (corsaires), qui infestent les mers. Le commerce que Venise fait avec les pays du Levant, comme la Syrie et l'Égypte, est considérable; on en tire toutes sortes de bijoux, des épices et des drogues, et d'autres "délicatesses que produit la nature pour efféminer les hommes". Venise y exporte du bois, de l'argent et du papier. Description de Venise.

fi 11 25 Seconde Relation : datée, Alexandrie, 25 Janvier 1502. Parti de Venise le 20 Octobre, D'Anghiera fait plusieurs escales et arrive à Alexandrie au lever du soleil, le 23 Décembre. Les habitants sont heureux de l'arrivée de ce bateau, qui apporte des marchandises, et "surtout à cause de l'or, de l'argent et du papier". La permission de débarquer est donnée par l' "Ammiraglio d'Alexandrie", c'est-à-dire l'Emir commandant la ville pour le sultan. Puis une estafette est envoyée au Caire, afin d'aviser la Cour que l'ambassadeur est arrivé et demander le sauf-conduit lui permettant de continuer son voyage. En attendant, D'Anghiera se promène en ville et note surtout l'état de délabrement dans lequel elle se trouve. Ce n'est pas la l'opinion d'un Européen, qui critique sans raison, car l'historien égyptien Ibn Iyâs relate la visite, peu précisément le sultan régnant, Qânsûh al-Ghuri, fit à Alexandrie en Janvier 1515. Il fit la même remarque sur la décadence de cette cité jadis illustre⁽¹⁾.

Le sauf-conduit du sultan se fait attendre, parce que les Maures, chassés d'Espagne et les Juifs émigrés établis dans le pays, ont intrigué contre l'ambassadeur catalan, ajoutant que sa suite n'est pas nombreuse, qu'il n'apporte aucun présent et que cette attitude est une offense à la majesté sultannique. D'Anghiera devra envoyer au Caire des émissaires spéciaux afin de calmer les susceptibilités de l'administration locale. Le Grand Drogman du sultan a communiqué au souverain les desirs de l'ambassadeur, et, le 25 Janvier deux seigneurs Mamlouks, "barons du sultan" lui apportent le sauf-conduit et l'accompagneront jusqu'au Caire, pour qu'il voyage en toute sécurité.

fi 26 — 71 Troisième Relation, datée : Alexandrie, 2 Avril 1502. le 26 Janvier, il se met en route, traverse le chemin sablonneux séparant Alexandrie de Rosette, en suivant comme beaucoup de voyageurs cette route de terre, et remonte le Nil. Le 31, à la tombée de la nuit, le bateau arrive à Bûlâq et deux autres Barons, envoyés par le sultan, le prient de passer la

(1) IBN IYAS, IV, p. 423 ss.

nuit dans son bateau. Au matin, le Grand Drogman vient immédiatement le voir, et D'Anghiera le questionne sur ses origines et son existence. Il raconte, qu'il est natif du royaume de Valence, il avait joint, jeune encore, un patron de navire, qui au cours d'une tempête s'était brisé sur les côtes de l'Egypte. Mis en prison pendant trois ans, il fut forcé de remiser sa foi, se fit musulman, dut changer de nom et s'appelle maintenant "Tangaribardino", soit Taghribardi. Grâce à ses qualités et à sa bonne conduite, il a atteint une haute situation, et maintenant "il est un des Barons du sultan et touche 6 à 8 mille sarafs d'or annuellement". Tandis que le drogman lui raconte son histoire, deux autres Barons arrivent amenant un cheval, envoyé par le sultan pour conduire l'ambassadeur en ville. Le cortège se forme et D'Anghiera est logé dans la maison de Taghribardi.

Dès lors, l'ambassadeur s'efforce d'être reçu rapidement par le sultan. Une première audience a lieu le 2 l'exri et l'auteur nous donne des détails intéressants sur le cérémonial de réception à la cour, le sultan et son entourage, le rôle du drogman et son habileté à présenter les questions. Cette première réception sultannienne est purement formelle et l'ambassadeur aura de nombreuses discussions avec le Drogman, qui lui communique l'hostilité de la Cour, les préventions des Mamlouks et les craintes que le sultan a exprimées à la suite des intrigues qui ont repris de plus belle. Reçu enfin en audience secrète, Ghauri finit par accepter les propositions de l'ambassadeur catalan et l'on signe les "Capitulations" sous l'autorisation de restaurer la cité de Jerusalem et de réparer les constructions élevées par les Chrétiens, qu menaçaient ruine, abandon des nouvelles taxes et exactions, augmentées sans droit aucun par les fonctionnaires égyptiens et que les pèlerins ne pouvaient pas payer; promesse de ne plus infliger d'injures aux pèlerins et de punir qui les molesterait. D'Anghiera, qui avait cru un instant devoir repartir sans avoir réussi dans sa mission est fort heureux. Le sultan lui facilite la visite des Pyramides, de Mataneh et de l'arbre du baume. Il a eu le temps de s'informer sur l'histoire de l'Egypte et des sultans

Mamlouks. Enfin, le 26 Février, en séance solennelle au palais, le sultan le fait revêtir suivant la coutume d'un vêtement d'honneur, merveilleusement "tisse d'or, avec de très belles lettres mauresques, et double d'hermine de grand prix". On le ramène en cortège a son domicile en lui faisant traverser le cimetière où sont élevés les tombes des Mamlouks, et le 27 Février il repart pour Alexandrie sur les barques sultanienues accompagnée par les mêmes Barons qui l'avaient amené. L'Amiral de la ville le reçoit au nom du sultan et au début d'Avril, D'Anghira repart pour l'Europe.

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Il y aurait lieu de reprendre plusieurs des chapitres consacrés particulièrement à la réception sultanienne ou à l'histoire des Mamlouks, à Qâyt-Bây, a ses successeurs, et au sultan Ghauri alors régnant, cela pourra être fait ailleurs. Je voudrais me limiter ici à résumer ce que nous savons de ce Grand Drogman Taghribardi, car ces détails pourront servir à l'illustration de cette fonction.

Le personnage n'est pas un inconnu, l'historien égyptien Ibn Iyâs le cite à plusieurs reprises : "en Dhû'l-Qa'da 911 (Mars - Avril 1506), dit-il, le Tardjumân Taghribardi partit en voyage vers les pays des Francs. Il avait avec lui une lettre du Patriarche (s. ent. d'Alexandrie), car les dommages causés par les Francs sur les côtes s'aggravaient et ils s'emparaient des biens des marchands"⁽¹⁾. Il alla en effet à Venise et à Florence, afin de discuter divers arrangements commerciaux. Dans une lettre en italien, conservée aux archives de Florence, la Seigneurie remercie, en date du 15 Avril 1507, le sultan des avantages promis par "l'ambassadeur égyptien Tanghalavardi", qui s'est rendu ensuite à Venise⁽²⁾. Il rentrera en Egypte au bout de dix-huit mois d'absence, car plus loin Ibn Iyâs note : "en Djumâdâ 913 (Septembre 1507), le drogman rentra de voyage; bien reçu par le sultan, il reprit ses fonctions⁽³⁾". "Nous

(1) IBN IYAS, IV, p. 91.

(2) AMARI, *Diplomi Arabi*, 2 a Serie, No. XLIX, p. 387.

(3) IBN IYAS, IV, p. 120.

connaissions exactement la date de son retour grâce au voyage de Martin Baumgarten, dont le bateau partit en même temps que lui de Venise, fit à peu près les mêmes escales et entra le même jour dans le port d'Alexandrie. Voici le récit de son arrivée à Alexandrie et de son voyage au Caire⁽¹⁾.

Ayant quitté Venise le 25 Juillet 1507, il s'arrête à Pola, où arrive peu après une galère vénitienne qui a à bord "Tongobardin, ambassadeur du sultan d'Egypte auprès de la République de Venise. Il débarque et le gouverneur de la cité le reçoit avec de grands honneurs. Hors de ville est un vieil arbre, dont les branches couvrent un vaste espace; de ses racines sourde une source agréable, d'eau fraîche; c'est là, à l'ombre, qu'on plaça des sièges couverts de soie et une table fournie d'une grande variété de mets curieux, que servaient un grand nombre de serviteurs. Lorsque Tongobardin se fut assis, mes compagnons et moi, et quelques marchands vénitiens invités, nous prîmes place. On mangea et l'on but beaucoup de cette eau rafraîchissante, car il faisait très chaud". Après avoir continué leur voyage, ils arrivent le 9 Septembre au soir dans le port d'Alexandrie, et le 10, au lever du soleil, "Tongobardin, ambassadeur du sultan, que nous avions amené avec nous depuis Venise, débarque. Toute la jeunesse de la ville vint l'entourer pour le voir et lui témoigner son respect. Le commandant de la ville était présent avec une grande troupe de Mamloûks, tous bien montés, et une foule de gens, qui faisaient un bruit confus et très désagréable avec leurs tambours et d'autres instruments, afin de le recevoir magnifiquement. Le Consul de Venise, qui avait décoré richement beaucoup de bateaux avec des banderolles, et portant des musiciens, attendait l'ambassadeur sur la rive, à la grande admiration et à l'étonnement des habitants. De plus, tous les bateaux du port saluèrent Tongobardin en tirant du canon, ce qui remplissait l'air d'un bruit assourdissant et de fumée". Avant de quitter Alexandrie, les commerçants, "qui avaient été recommandés à Tongobardin le Mamloûk, eurent plus d'une fois

(1) Martini à BAUMGARTEN *Peregrinatio in Aegyptum, Arabiam, Palaestinam et Syriam*, Noribergae, 1594, p. 29 ss 34, 42, 45 — 46

l'occasion de parler avec lui, et lui firent présent de 50 pièces d'or, appelées *serafi*, afin que, par sa faveur et sa protection, ils puissent voyager en toute sécurité". Les voyageurs partirent pour Rosette le 22 Septembre, et ce jour même "Tongobardin vint au port d'Alexandrie avec un grand nombre de charreux, qu'il chargea de ses bagages, et, arrivé à Rosette, il s'embarqua avec ses deux femmes, qu'il avait alors amenées avec lui, dans un second bateau il mit ses Mamloûks et dans un troisième une foule mélangée de gens. Partis le 25, ils remontent le Nil. Chaque soir Tongobardin faisait attacher une série de lampes en forme de pyramide et de petites clochettes aux voiles de ses bateaux, et le vent en les mettant en mouvement donnait lieu à une agréable mélodie. Tandis que ses Mamloûks dans l'autre bateau tiraient en l'air des espèces de flèches enflammées, qui paraissaient des étoiles filantes ou des éclairs. Nous suivions dans le dernier bateau, divertis par la musique d'un Egyptien qui jouait de la trompette". Arrivés à Bouîlâq le 28 Septembre au soir, les voyageurs seront logés dans la maison de ce grand drogman. C'est un palais magnifique, digne de ce patron des chrétiens, qui viennent au Caire. A son retour d'Europe, tous les grands personnages vinrent lui rendre visite, même le calife, qui est leur chef religieux".

Dans un autre document des Archives de Florence, daté du 22 Djumâda II 913 (28 Octobre 1507), le nom du drogman égyptien reparait. Le sultan envoya en effet aux Florentins une lettre, confirmant les privilèges accordés lors de la visite de son ambassadeur. Dans cet acte, le drogman porte tout une série de titres honorifiques comme ceux que l'en trouve appliqués aux fonctionnaires d'un grade élevé de l'administration sultanienn⁽¹⁾. Et deux ans après, le sultan envoie, le 14 Rabi' I 915 (2 Juillet 1509), des instructions aux fonctionnaires d'Alexandrie, spécifiant les avantages accordés aux Florentins. Celui qui est chargé de transmettre ces ordres est "Saïf addîn Taghri Bardi, un des notables des émirs de

(1) AMARI, *Diplomi*, la serie, No. XLIII, p. 218 ss.

dix, drogman à nos Sublimes Portes" (1). Tous ces titres ne doivent pas être pris à la lettre et marquent seulement que le titulaire a un poste important dans l'administration. Le drogman est par contre effectivement "émir de dix" comme le dit le document, ce qui est un degré peu élevé dans la hiérarchie militaire des Mamloûks.

Il semble que Taghri bardî avait eu d'autres préoccupations que des transactions commerciales pendant son séjour en Europe; en effet Ibn Iyâs nous dit : "au mois de Radjab 915 (Octobre Novembre 1509), le sultan répartit sur la communauté Maghrébine le paiement d'une somme de 12 mille dinars, pour le motif suivant : lorsque le drogman Taghri Bardî s'était rendu chez les Francs, il avait racheté un certain nombre de prisonniers du Maghreb pour la somme de 50 mille dinars environ. Lorsqu'ils furent libérés, le sultan exigea que l'on répartit sur la communauté des Maghrébins du Caire et d'Alexandrie la somme correspondante à ce qui avait été payé par le trésor" (2).

Les affaires se gâtèrent bientôt entre le drogman et son maître, exemple entre mille des tribulations des fonctionnaires Mamloûks : "le mardi 11 Muharram 917 (10 Avril 1511), le sultan fit arrêter le drogman, on le mit aux fers et on chargea un autre de ses fonctions. Les scellés furent mis sur sa maison, on inventoria tout ce qui s'y trouvait, et on décréta de le réduire à l'indigence. La raison de cette mesure était, que le sultan avait appris que Taghri Bardî avait écrit des lettres aux rois Francs, les informant de la situation du Royaume égyptien, que le souverain n'avait nullement l'intention de faire une campagne militaire, que les côtes étaient libres, et qu'il n'y avait donc aucun obstacle (pour agir). Des lettres du drogman dans ce sens furent apportées au sultan, qui s'emporta contre lui, le fit jeter aux fers, nomma un autre à sa place, fit amener son cheval et apporter ses vêtements d'honneur. Et le drogman est resté jusqu'à aujourd'hui sous cette condamnation" (3).

(1) *Idem*, No. XLIV et XLV; 2 a serie, No. II et LII.

(2) IBN IYAS, IV, p. 164.

(3) *Idem*, p. 210.

Il m'est impossible de dire, si cette accusation avait un fondement quelconque.

Le poste de grand drogman ne sera repourvu que trois ans plus tard⁽¹⁾ : "fin du mois de Muharram 920 (Mars 1514), le sultan nomma un mamloûk, appelé Yûnis, comme tardjumân, à la place du drogman Taghri Bardi. Car cette fonction était restée vacante depuis que les dispositions du sultan à l'égard de Taghri Bardi avaient changé. Ce Yûnis fit d'abord partie du corps des zardkash (surveillant d'arsenal), puis devint vicedrogman, et enfin drogman, tout comme l'avait été son prédécesseur". C'est ce Yûnis, qui recevra en 1512 André Le Roy, envoyé de Louis XII, roi de France, et Trévisan, ambassadeur de la République de Venise, qui le dit originaire de Vérone, sans l'appeler par son nom⁽²⁾.

Je ne sais pas, depuis quelle époque Taghribardi était en fonction; mais il est certain que, sous le règne de Chauri, il devait avoir atteint l'âge mûr. Il était sans doute dans les services du drogmanat depuis la fin du règne de Qâyt-Bây, car c'est sûrement lui qui a donné à D'Anghiera la matière des chapitres sur l'histoire égyptienne, en particulier ceux consacrés aux Mamloûks, à Qâyt-Bây toujours applé "grand sultan", et à ses successeurs. Son prédécesseur immédiat nous est connu par la relation de voyage de Lengherand qui fut reçu précisément par Qâyt-Bây; il s'appelait "Gavardin", sans doute Djânbarî, Gânvardî, c'est-à-dire "le dévoué", nom qui convient particulièrement bien à un tel fonctionnaire⁽³⁾.

Etienne Combe

(1) IBN IYAS, IV, p. 361 — 362.

(2) *Viaggio* di Domenico TRÉVISAN, *Ambasciatore Veneto al gran Sultano del Cairo nell'anno 1512*, descritto da Zaccaria Pagani di Belluno, Venezia, 1875. Autre édition, en français, par Scheler, Paris, 1884, à la suite du "Voyage" de Jean Thénaut. Rappelons ici le tableau de l'école de Gentile Bellini, au Louvre, intitulé "Reception d'un ambassadeur vénitien au Caire", qui illustre cette ambassade.

(3) *Voyage de Georges LENGHERAND à Venise, Rome, Jérusalem, Mont Sinai et le Kayre, 1485 — 1486*, Mons, 1861 : page 179.

REMARQUES

sur

LE TEMPS CHES DESCARTES.

Dans les *Regulae*, Descartes nous dit que nous avons une intuition de la durée comme chose absolue, comme nature simple⁽¹⁾. Si une distinction s'établit dès le début des *Regulae* entre l'intuition et la déduction, Descartes insiste pourtant sur la possibilité de retrouver l'intuition sous-jacente, même à un raisonnement composé. Non seulement une pensée suffisamment rapide arrivera à faire coïncider une multiplicité d'appréhensions avec un *intuitus* unique⁽²⁾; mais toute déduction ou toute réflexion se constituent elles-mêmes d'une série de certitudes intuitives⁽³⁾. Or, Descartes n'insinue certes pas dans les *Regulae* que l'intuition de la durée dont il parle en épuise vraiment le contenu. En effet, la réflexion sur le temps ou plus précisément sur la durée est un des morceaux essentiels de la réflexion cartésienne sur la durée, sur l'existence, sur le moi qui existe; et si toute réflexion se compose d'un ensemble d'intuitions, de saisies circonstanciées et précises de la chose, nul doute que la réflexion sur le temps n'ait finalement conduit Descartes à une intuition riche comportant une pluralité d'aspects ramassés pour lui, mais pouvant de nouveau se déployer pour une pensée qui est, elle aussi, inévitablement temporelle et successive.

C'est un déploiement de ce genre que nous voudrions opérer au sujet de la durée; et ceci dans le but non seulement de rafraîchir notre connaissance du fondateur de la pensée

(1) Règle XII.

(2) Règle VII.

(3) Ibid.

métaphysique moderne, de repenser l'oeuvre cartésienne dans l'une de ses perspectives les plus ingénieuses; mais surtout pour voir l'intime contact que Descartes maintient avec la pensée contemporaine dans l'une de ses phases les plus neuves et les plus profondes.

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Un premier trait de la durée est ce que l'on pourrait appeler sa multivalence ou plus précisément son ambivalence. Il y a durée aussi bien des choses corporelles que des choses spirituelles, des choses mues et des choses non-mues; et cette durée est absolument la même. Descartes sent le besoin de revenir à cette notion capitale non seulement dans ses ouvrages systématiques mais aussi dans sa correspondance⁽¹⁾.— A ceux qui, comme Arnauld, veulent établir une nuance ontologique entre la durée des esprits et la durée des corps, Descartes réitère sa position et maintient que, sur ce point au moins, il ne peut y avoir de différence⁽²⁾. Il semble que les notions dites mixtes ou générales fassent exception, pour les raisons que nous verrons, à la radicale distinction des esprits et des corps.

Un second caractère de la durée, c'est sa *continuité*⁽³⁾. Descartes, semble-t-il, glisse sur ce caractère en passant; mais nul doute, qu'il doive avoir à ses yeux une importance capitale puisque, ainsi qu'on va le voir bientôt, il paraît contredire un autre caractère fondamental, à savoir la divisibilité du temps en moments; en d'autres termes, sa discontinuité. Mais en outre, la continuité importe directement à ses réflexions sur le temps, étant donné qu'elle va éclaircir la difficulté justement signalée au sujet de ses notions ambivalentes, applicables aussi bien aux choses matérielles qu'aux choses immatérielles. Il semble que de telles notions ne cadrent pas directement avec une

(1) Princ. I parag. 57 aussi Adam et Tannery (A.-T.) V. pp. 139, 223.

(2) A.-T. V. 223.

(3) Principes I, parag. 55.

description franchement dualiste de l'essence des choses. L'application des notions en question devra être d'un autre ordre, leur clarté et distinction posées sur un autre plan.

La durée, dit Descartes, c'est la continuité de l'être. Une substance qui dure est une substance qui continue d'exister. Il n'y a pas un moment où elle existe et un moment où elle soit ôtée de l'être; toujours elle est, et son être précédent non seulement se lie avec son être présent mais il fait corps avec lui. La raison pour laquelle il semble que Descartes n'explique pas davantage cette continuité, c'est donc qu'il met plutôt l'accent sur un caractère qui en est l'expression tangible.— Demandons-nous bien qu'est-ce qui dure? C'est la substance et pas autre chose, c'est la chose corporelle ou spirituelle en tant que substance. Dès lors la durée n'apparaît pas simplement comme un mode ou une façon de considérer une chose en tant qu'elle continue d'être. Pour qu'elle se trouve dans les choses créées toujours de la même manière, la durée doit être un attribut et non plus simplement une quantité⁽¹⁾. On peut donc soutenir que du moment qu'il n'y a point de substance qui ne cesse d'exister lorsqu'elle cesse de durer, la durée n'est distincte de la substance que par la pensée⁽²⁾. Mais alors, désigne-t-elle un élément de leur essence de leur nature? Ce n'est guère possible. Il faut donc concevoir que l'inséparabilité est double: dans un cas il s'agit d'une inséparabilité d'essence, dans l'autre l'inséparabilité est existentielle. Dire que la durée est un attribut aussi bien des corps que des esprits, c'est donc dire que c'est avant tout un attribut *existentiel*. La notion de durée nous donne par conséquent un aperçu des substances, différent de celui que nous donnerait l'examen de la distinction réelle et essentielle.

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Passons maintenant au troisième caractère fondamental de la durée, caractère duquel dérivent les autres caractères et dont l'intelligence nous donnera la clef des problèmes ontologiques

(1) Principes I, parag. 56.

(2) Ibid I, parag. 62.

et théologiques du temps. La durée est *divisible*. Descartes range très souvent la durée avec le nombre parmi les notions mixtes. Or le nombre est divisible; la durée n'est-elle pas aussi une grandeur qui s'étend et qui peut-être se mesure⁽¹⁾? La durée est parmi ces choses dans lesquelles nous ne remarquons point de limites, soit que nous allions dans le sens de l'augmentation et de la multiplication, soit que nous allions dans le sens de la diminution et de la division. Et comme nous ne remarquons pas de bornes à notre capacité d'un côté comme de l'autre, nous disons que la durée est indéfiniment grande et indéfiniment divisible. Indéfinie, certes, mais pas infinie⁽²⁾; car alors que l'infinité est un caractère positif désignant une perfection absolue, la divisibilité infinie de la durée procède du défaut de notre entendement⁽³⁾ qui ne saurait s'appliquer à une chose comme la durée sans la morceler.

Le caractère en question n'est donc pas un caractère de nature⁽⁴⁾; il ne constitue pas l'essence de la durée. Comment donc dérivent de lui les autres caractères de la durée? Comment surtout peut-on tabler sur lui pour passer d'une existence finie et imparfaite à l'existence infinie et absolue? C'est qu'il doit y avoir une autre acception de la divisibilité de la durée, acception qui convient à la chose même qui dure en tant qu'elle dure. Alors que dans le premier sens, la division pouvait se faire indéfiniment, au détriment même de la réalité concrète; ici division signifie clairement saisie de moments concrets distincts les uns des autres. Je vois clairement que les parties du temps peuvent être séparées les unes d'avec les autres⁽⁵⁾. Voilà une première caractérisation de la divisibilité qui va nous permettre d'avancer dans notre chemin.

Qu'il ne soit plus question de caractères quantitatifs, au

(1) A.-T. V, 52, 53.

(2) A.-T. V, 51.

(3) Principes I, parag. 26-27.

(4) parag. 27.

(5) Réponses aux premières objections. A.-T. VII, 109.

sujet de la durée, attribut existentiel, c'est ce qui apparaît clairement quand on veut bien examiner attentivement les termes de Descartes. Je dis que les moments du temps sont séparés. Cela signifie-t-il que le temps ne serait plus alors un continu ? La division et la séparation en question ne nous orientent pourtant pas vers cette conclusion : ce n'est pas au cours ou au train des choses que l'on veut se référer ici mais au rapport intrinsèque des composants si toutefois on a le droit de parler de composant lorsqu'il s'agit de la durée. Mais on en a le droit puisque les choses pouvant durer dans l'être, la mort peut nous surprendre à chaque instant⁽¹⁾ ; ma durée peut elle-même se séparer de la durée des choses.

En effet, je vois que les parties du temps peuvent être séparées les unes des autres et que de ce que je suis maintenant, il ne s'ensuit pas que je doive être encore après. C'est dire que la séparation en question désigne bien l'indépendance des moments du temps les uns par rapport aux autres ; ou encore mieux leur non-dépendance mutuelle. En effet, si chaque moment du temps était indépendant, je conclurais que l'ensemble du temps le serait également. Or c'est précisément cette non-dépendance qui exclut toute idée d'ensemble de moments ; la durée consiste précisément en ce que les moments ne coexistent pas, n'existent jamais ensemble⁽²⁾. Il y a dans la notion de coexistence une certaine détermination réciproque des parties coexistantes ; dans le temps, les moments quoique continus, ne dépendent point les uns des autres, ne se déterminent surtout point mutuellement. En affirmant, par conséquent, la divisibilité du temps, j'affirme le caractère intrinsèquement inachevé, le caractère indéterminé du temps. Le temps supposé donné, c'est l'indétermination intrinsèque, radicale et inévitable qui caractérise dorénavant toute existence⁽³⁾.

(1) A.-T. V, 552—553.

(2) Voir dans l'Entretien avec Burman un texte remarquable à cet égard (V, p. 155).

(3) Un texte péremptoire de Descartes sur le caractère indéterminé du temps se trouve dans sa réponse à Gassendi. Celui-ci soutient un enchaînement rigoureux dans la suite temporelle. Descartes fait remarquer que =

Il va sans dire que Descartes n'érige pas la durée en un absolu, pas même en un absolu *vécu*. La durée est un attribut existentiel, il est vrai, mais c'est un attribut quand même; et comme tel, il est indétachable de la substance, de la chose corporelle ou spirituelle qui existe; la durée, en dehors de la substance qui dure est tout au plus l'objet d'une abstraction illégitime⁽¹⁾. Or, l'attribut en question, différemment des attributs de l'essence, est ce qui fait qu'une substance ne s'explique pas elle-même, ce qui fait qu'une substance posée dans l'existence, n'est pas par soi. La réflexion sur la durée des corps, la conscience de notre durée, nous font toucher du doigt ce que l'on désigne si bien en anglais par le terme de *helplessness*. En effet les corps sont *helpless*; les esprits aussi. Prenons un corps en mouvement ou même un corps en repos : admettons même qu'il se soit posé lui-même dans l'existence, dans la durée, soit en repos soit en mouvement. Or même si l'on suppose que ce corps ait été jusqu'en ce moment par soi, c'est-à-dire sans cause extérieure, il ne s'ensuit pas pour cela qu'il doive être encore dans l'avenir⁽²⁾. De même pour moi, supposons que je sois créé de toute éternité; l'indépendance des parties de ma durée signifie que de ce que je suis maintenant il, ne s'ensuit pas que je doive être encore après⁽³⁾. Si le temps se caractérise par une transition du présent à l'avenir ou par une transition du passé au présent, je vois clairement non pas qu'une transition soit discontinue, mais qu'elle est simplement inexplicable par ce qui l'occupe, par ce qui est en transition; elle nous conduit

— parler ainsi, c'est exactement se mettre en dehors de la réalité du temps vécu. (A.-T VII, 301, 369-370). M. Wahl dit si bien : "Que veut dire d'une façon précise cette idée de l'indépendance des moments du temps ? Elle veut dire que je puis mourir dans l'instant qui suit le moment présent, que ce moment peut ne pas durer. On peut si l'on considère le temps d'un point de vue abstrait soutenir qu'il y a consécution nécessaire entre les moments, mais non pas si on considère le temps concret; les moments ici peuvent être séparés." (*Du rôle de l'idée de l'instant*, p. 24).

(1) Princ. I, parag. 62—63.

(2) Réponse aux 1ères objections A.-T. V, 110.

(3) V, 109.

nécessairement à poser la question : comment est-on en transition, comment traverse-t-on le temps, quand on ne peut pas le faire par soi-même ? Or ce que nous disons de la transition, nous le dirons aussi de l'immanence présente. On a simplement supposé que le corps ou le moi aient été par eux-mêmes, ne serait-ce qu'un instant ; mais la supposition est elle-même fictive et dénuée de sens. Le moi a non seulement conscience de son passage dans l'être mais aussi de sa présence. Or, "nous connaissons aisément qu'il n'y a point de force en nous par laquelle nous puissions subsister ou nous conserver un seul moment"⁽¹⁾. En s'interrogeant sur sa propre existence, "on ne trouve en soi aucune puissance capable de la conserver seulement un moment"⁽²⁾.

* * *

II

L'existence temporelle révèle précisément une espèce de crise métaphysique. Du point de vue de la certitude du *cogito*, ma durée présente le paradoxe suivant : j'existe et je continue d'exister alors que je devrais, si toutefois je me suffisais à moi-même, me poser dans l'existence et opérer la continuité de mon existence. Or, la durée est un fait irrecusable ; et s'il m'indique continuellement mon incapacité, je ne puis en prendre fortement conscience que si j'accepte la nécessité d'une recherche causale qui passe de l'immanent au transcendant. C'est à cette condition, semble-t-il, que je puis mettre fin à la crise en question.

Il est inutile de développer pour l'instant le second argument de l'existence de Dieu. Nous nous contentons simplement de remarquer ce qu'il y a d'injuste à le considérer comme un argument populaire, adapté aux esprits grossiers et sensibles⁽³⁾. Si Descartes indique qu'il faut procéder à cette

(1) *Princ.* parag. 21.

(2) 1ère Réponse. Voir aussi 3ème *Méditation* : "Et il est très manifeste qu'en cela il ne peut y avoir progrès à l'infini ; car il ne s'agit par tant ici de la cause qui m'a produit autrefois, que de celle qui me conserve présentement.

(3) Voir Boullier. *Histoire de la Philosophie Cartésienne* 1, 87 — 91.

preuve au moment où nous ne pouvons plus capter notre attention sur la cause de l'idée de l'Être infini et parfait, il indique également que la recherche de la cause de mon existence temporelle devrait au fond précéder temporellement et logiquement la recherche première⁽¹⁾. Car il est normal de se demander quelle est la cause du moi qui pense à Dieu, avant de se demander quelle est la cause de cette même pensée. En effet la première certitude métaphysique, à savoir la conscience du *cogito*, est elle-même contemporaine de la certitude de mon existence dans le temps, elle coïncide avec elle⁽²⁾.

Or cette existence du moi dans le temps s'est révélée comme indéterminée, comme contingente; mais d'une indétermination et d'une contingence qui appellent une cause à la fois déterminée, autarchique et nécessaire. C'est en cela seul que réside peut-être l'intérêt de la seconde preuve. Le passage métaphysique du causé au causant est à peine un passage; ce n'est pas que ce que je nie de l'un je l'affirme de l'autre; c'est moins encore par analogie que je passe du moi à Dieu. L'indétermination et la contingence requièrent un type privilégié de l'explication cartésienne. Nous avons là, semble-t-il une immédiation, une union indéchirable du causant et du causé; la transcendance et l'immanence ne sont pas le moindrement séparées. Si l'argument qui aboutit à l'affirmation de l'actualité de l'Infini à partir de la pensée de l'Infini n'est pas proprement un argument discursif, il est évident qu'il ne prend par suffisamment ses racines dans l'existence; il semble sauter par-dessus la priorité du *cogito* pour rejoindre la certitude précritique des mathématiques, je dirai la certitude angélique de l'étendue cartésienne. Ici, au contraire contraire, baignés dans l'existence, nous y restons en la dépassant.

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L'enquête sur la notion de temps, de mon existence

(1) 3ème Méditation. A.-T. VII, 48.

(2) "Je suis, j'existe. cela est certain, mais combien de temps ? A savoir autant de temps que je pense etc..." 2ème Méditation.

temporelle est en même temps une enquête sur la structure métaphysique de l'essence et de l'existence divines⁽¹⁾; et réciproquement la lumière à laquelle j'arriverai rayonnera sur mon existence et la transformera. En effet, l'enquête sur mon existence temporelle, ne peut en aucune manière être assimilée à une enquête sur toute espèce de perfections ou de vertus : la réponse à la question : pourquoi j'existe, a ce privilège, tout au moins, d'anticiper sur la solution de toute question concernant ce qui m'appartient et ce qui m'est en défaut. Il apparaît immédiatement que si je m'étais moi-même soulevé du néant, je n'aurais pas manqué de m'octroyer toutes les perfections qui me faisaient défaut⁽²⁾. Il y a dans l'acte de poser l'existence, ou mieux encore, dans celui de passer du néant à l'existence, une force telle qu'elle puisse conditionner tout le reste. Il ne s'agit pas ici d'évaluer le prix de ce que possède le moi temporel par rapport aux perfections infinies qui lui manquent. Le prix, la valeur, si toutefois cela a un sens, réside dans l'absoluité de l'acte; il réside aussi dans le fait qu'étant donné cet acte absolu que j'appellerai dorénavant l'acte créateur, toute perfection peut en résulter. Si je dis que du fini à l'infini le passage est impossible, je dirai encore davantage que le passage est, humainement parlant, impossible, du néant à l'être. Dieu seul est capable de le franchir.

Mais alors il apparaît immédiatement qu'en prenant conscience de l'être temporel comme de l'être non *par soi*, je connais Dieu comme *cause de soi*⁽³⁾. Quel rapport pourtant la notion de *causa sui* peut-elle entretenir avec l'existence temporelle, quelle lumière peut-elle jeter là-dessus ? Et ne suis-je pas là en face d'une cause qui ne soit ni prochaine ni adéquate ? Il n'en est rien cependant.

De même que l'existence temporelle révèle mon incapacité à l'égard de moi-même, de même aussi le créateur révèle sa

(1) "De plus je n'ai pas seulement cherché quelle est la cause de mon être en tant que je suis une chose qui pense... etc..." (A.-T. IX, 85—86).

(2) A.-T. VII, 48.

(3) A.-T. VII, 109.

capacité absolue, son autarchie à l'égard de soi-même. Si Dieu se définit par rapport à mon être dans l'acte créateur, je ne puis, bien entendu, le définir par rapport à soi-même, par les mêmes conditions de dépendance; je ne dirai pas qu'il est cause de soi *comme* il est cause de mon être⁽¹⁾. Et je comprends l'absurdité de poser la distinction non seulement temporelle mais également logique de Dieu comme cause et de Dieu comme existant. Mais il va de soi que Dieu ne me fait passer du néant à l'être que s'il possède à la fois la puissance et l'être; ou s'il est la puissance de l'Etre, le pouvoir de l'être; et c'est de l'abondance à la fois de cet être et de cette puissance que je reçois l'existence. Dès lors il n'y a plus de raison de nier que la richesse de sa nature soit telle que rien n'explique son être que lui-même⁽²⁾; qu'il est à proprement parler *cause de soi* autant que je ne suis pas cause de moi. Si pour moi la certitude dernière est donnée dans l'expérience temporelle, la certitude de la cause de soi est donnée dans l'expérience ineffable pour moi de ce qui est toujours permanent, toujours le même et de même sorte. "L'essence de Dieu est telle qu'il est impossible qu'il ne soit ou n'existe pas toujours"⁽³⁾. En ce sens, être toujours, ne jamais être exposé au non-être, ne fait que traduire pour moi dans le temps la structure métaphysique de Dieu, cause de soi; tout aussi bien que mon existence qui passe perpétuellement dans le néant, me révèle la structure métaphysique de mon être propre.

Mais afin de saisir plus pleinement encore la *proximité* et l'*adéquation* de cette cause, il faudra que je détaille la transformation que subit pour ainsi dire ontologiquement l'existence temporelle, par l'effet de l'acte créateur. L'expérience de la durée s'est révélée en fin de compte comme l'expérience d'une multiplicité de moments ne dépendant aucunement les uns des autres; en somme une existence qui, à mesure qu'elle se déploie, finit et recommence sans cesse. Or l'existence ainsi inachevée

(1) A.-T. VII, 108.

(2) A.-T. VII, 111.

(3) A.-T. VII 109.

s'appuie à l'acte créateur. Dirions-nous donc que l'acte créateur, lui aussi, recommence sans cesse ? Nous serions tentés, par une ambiguïté difficilement évitable, d'ériger ces moments du temps en être indépendants ; et de ce que ces moments requièrent un acte absolu d'explication, je passerai insensiblement à une multiplicité atomique d'actes créateurs. Mais de là, hélas, il devient inévitable de poser une multiplicité de ruptures entre les actes créateurs, une multiplicité de ruptures entre ceux-ci et les actes destructeurs.

Or, Descartes est extrêmement net sur ce point ; il y aurait contradiction à poser un intervalle "entre la destruction d'un premier monde et la création d'un nouveau"⁽¹⁾ ; ce serait transporter du non-être dans l'être par excellence, dans l'être pur. Cette contradiction extrêmement grave vient d'une double erreur. Premièrement, à cette existence qui recommence sans cesse, nous avons cru bon d'attribuer une création qui recommencera sans cesse ; conserver un être à travers le temps, c'est le créer derechef ; la conservation est une création continuée. Mais ceci n'a de sens que pour une pensée qui se maintient dans l'abstraction et l'irréalité : du point de vue de Dieu, il n'y a qu'un seul acte créateur⁽²⁾. La Création se ramène à un seul acte qui possède une puissance, une expansion infinie, pourtant infiniment incompréhensible pour moi ; la création n'est ni ancienne ni nouvelle ; ou plutôt elle est absolument neuve puisqu'il n'y a jamais eu qu'elle. L'expression "création continuée" n'a de sens que parce qu'elle se réfère à une continuité d'exercice ou mieux encore à un effet qui est *continu*. Et voilà la deuxième erreur capitale : puisque métaphysiquement parlant l'existence temporelle est une existence qui recommence sans cesse, elle devrait être l'expérience de moments absolument et atomiquement discontinus. On oubliera donc que l'un des traits de la durée, c'est sa continuité. A

(1) A.-T. V, 343.

(2) "En sorte que la lumière naturelle nous fait voir clairement que la conservation et la création ne diffèrent qu'en regard de notre façon de penser et non point en effet" (3ème Médit.)

des moment discontinus, force nous est de recourir à des actes créateurs multiples ou tout au moins à une *création continue*.

La vérité est que la découverte de la cause de soi ou de l'acte créateur enlève toute espee d'ambiguïté à la notion de l'être temporel. Prendre concrètement le temps, consiste à la fois à penser à la non-détermination réciproque de ses moments et à leur détermination en bloc par l'acte créateur. Or cet acte créateur n'est pas simplement donné puis abandonné : Dieu à l'égard de l'existence n'est pas comme un architecte à l'égard d'une maison ou d'un père à l'égard des enfants qu'il a engendrés. C'est qu'il faut distinguer, avec les auteurs scolastiques, entre la cause *secundum fieri* et la cause *secundum esse* ; or celle-ci est permanente, perpétuelle parce qu'absolument une et parce qu'elle se suffit dans son unité. Or il en résulte non une existence qui se tiendra ou périra par elle-même, mais une continuité, une durée dans l'être⁽¹⁾.

Si l'existence temporelle est caractérisée comme il a été dit, il est normal de se demander ce que signifie dorénavant l'éternité. Le paradoxe cartésien, à ce sujet, consiste à affirmer de celle-ci ce qui est vrai de l'existence temporelle. Aucune preuve n'est en fait donnée par Descartes en faveur de la vie éternelle. C'est que précisément elle n'a besoin d'aucune preuve ; une simple possibilité suffit à son égard, et la foi nous renseigne sur le reste. Or, la possibilité de l'éternité se confirme par l'attitude de notre esprit à l'égard du temps comme train existentiel et comme longueur : à mesure que nous suivons par un acte de l'esprit le temps dans le passe, nous ne voyons aucune raison d'arrêter le temps à un moment plutôt qu'à un autre, aucune surtout pour l'arrêter à quelque moment que ce soit. Si le temps était indéfini quant au passé, il n'y aurait là rien qui soit incompatible avec la perfection divine⁽²⁾. Le monde peut avoir été créé de toute éternité, et ceci non seulement ne lui enlève pas son caractère de créature, mais, au

(1) A.-T. VIII, 369.

(2) A.-T. V, 51.

contraire, démontre la puissance infinie de Dieu⁽¹⁾. — Or, cette simple possibilité, quant au temps *a parte ante*, devient une certitude quant au temps envisagé *a parte post*. “La foi nous enseigne que bien que la terre et les cieux périront, c'est-à-dire changeront de face, toutefois le monde, c'est-à-dire la matière dont ils sont composés, ne périra jamais; comme il paraît de ce qu'elle promet une vie éternelle à nos corps après la résurrection, et par conséquent au monde dans lequel ils seront”⁽²⁾.

Maintenant, il est positif que de cette durée éternelle, promise par la foi, nous ne pouvons conclure à rien de certain concernant la durée indéfiniment passée; et ceci, non seulement parce que la foi ne nous a rien dit au sujet du passé ni qu'elle nous interdise d'y penser, mais plutôt de ce qu'on ne peut rien conclure de la destinée future à la préexistence indéfinie. Les moments du temps étant indépendants les uns des autres, on ne en peut inférer que le temps fût réellement *il y a* quant au passé⁽³⁾. — Ainsi nous rencontrons toujours ce caractère de la durée comme créature.

Si Descartes, en caractérisant l'existence éternelle, met l'accent sur son indétermination ontologique⁽⁴⁾, ce n'est pas qu'il nie de l'éternité la *continuité* maintenue au sujet de l'existence proprement temporelle. Seulement il y a une

(1) [Objection de Burman] “Mais une cause libre, on conçoit qu'elle existe antérieurement à ses effets et même à ses desseins. [Réponse] : “A ce compte les décrets du Dieu ne doivent pas être de toute éternité, surtout que le pouvoir de créer et la création ne supposent pas plus l'action en Dieu que ses décrets. Bien plus, les décrets sont des actes de sa volonté, comme aussi la création, par laquelle c'est qu'une volonté de Dieu, car si elle était autre, il arriverait en Dieu quelque chose de nouveau au moment de la création”. (A.-T. V, 155. Voir aussi trad. d'Adam pp 35 & 37).

(2) A.-T. (V, 52 — 53).

(3) A.-T. V, 53.

(4) “Les parties ne sont pas dans l'éternité qui est avant, toutes ensemble et en acte, puisqu'il n'y a qu'une seule partie qui soit ainsi, à savoir le présent...” (A.-T. V, 155. Voir trad. d'Adam p. 37) — Dans un texte précédent de l'*Entretien avec Burman* Descartes nie que l'éternité soit “simul et semel” (A.-T. V, 148 voir trad. Adam p. 11).

nuance fondamentale qu'il ne faut pas perdre de vue, nuance entre ce que nous appellerons tantôt la discontinuité de valeur et la continuité d'existence. Cette nuance vient précisément à point, quand nous comparons la pensée humaine qui se déroule dans le temps actuel avec cette même pensée telle qu'elle peut être dans l'éternité de Gloire. Une lettre au Marquis de Newcastle, comme l'entretien avec Burman, apportent à cet égard des renseignements tout à fait décisifs

Puisque l'existence se trouve révélée dans l'expérience du *cogito*, il est évident que la pensée humaine se trouve dans les mêmes conditions que l'existence du moi. Elle est continue; et cela signifie qu'une certaine épaisseur de durée est nécessaire à l'exercice concret de la pensée : il est inconcevable de soutenir que la pensée est instantanée⁽¹⁾, et par conséquent inconcevable qu'une pensée qui dure et persévère dans l'être soit composée *in actu* d'instants absolument indivisibles. Descartes n'insinue pas, en plus, que les pensées diverses et successives, non seulement durent chacune en elle-même, mais se continuent les unes les autres sans rupture; il va sans dire qu'il le soutient implicitement puisque l'existence est contemporaine de la pensée ou de la conscience. — Faut-il conclure de là que la pensée éternelle se distinguera de la pensée temporelle en ce qu'elle ne remplira pas de durée ou qu'elle en remplira mais d'une autre manière? Ce serait croire que la distinction devra porter sur le mode d'exercice propre à la créature. Or, il apparaît que si la vie éternelle possède quelque chose en propre, ce sera dans la mesure où elle est en communication plus directe avec Dieu que ne l'est la vie temporelle; ce sera dans la manière dont l'objet se rapportera ou se révélera à notre entendement. Notre connaissance de Dieu durant le temps est le plus souvent une connaissance discursive, qui requiert l'exercice de la mémoire et se trouve exposée par conséquent à l'oubli; elle est également dépendante du rythme de notre attention⁽²⁾. Est-elle jamais intuitive? Descartes

(1) A.-T. V, 148.

(2) Voir Laporte *La liberté chez Descartes* Revue de *Metaphysique* 1937 pp. 145 — 147.

ne peut le nier; mais cette intuition en plus qu'elle apparaît et disparaît tour à tour, ne suffit jamais à nous montrer Dieu tel qu'il est dans sa simplicité et dans son unité; surtout, elle appelle continuellement à son aide le raisonnement qui ne peut aboutir qu'à une vue approximative de Dieu.

"La connaissance intuitive⁽¹⁾ est une illustration de l'esprit par laquelle il voit en la lumière de Dieu les choses qu'il lui plaît lui découvrir par une impression directe de la clarté divine sur notre entendement, qui en cela n'est point considéré comme agent, mais seulement comme recevant les rayons de la divinité"⁽²⁾ — C'est dire que la connaissance surnaturelle est illuminative; c'est dire surtout que la dépendance de la créature par rapport à Dieu ne sera pas moindre mais plus grande dans l'éternité. Mais alors que la dépendance ici-bas se manifeste dans la conscience du passage continu de notre être, la dépendance éternelle consistera en la manière plus intime par laquelle Dieu se fait connaître à nous. Il semble que la pensée éternelle sera continuellement nourrie par Dieu; elle n'aura pas de répit pour se reprendre en dehors de la lumière divine; elle n'aura pas, par conséquent, le temps d'échapper à elle-même de nouveau. Alors que les moments du temps sont toujours en train de disparaître et d'apparaître, les moments de l'éternité seront remplis par la vision de Dieu; chacun de ses moments se suffira à lui-même. La non-détermination réciproque des moments du temps deviendra l'auto-détermination de la vie éternelle; sur le plan de la valeur, les moments de l'éternité seront indépendants et autarchiques. Dans l'éternité par conséquent, se substituera, à la continuité de l'existence, une discontinuité de valeurs.

Par ces indications, Descartes nous renseigne énormément; il avoue lui-même qu'il ne pourra pas aller au-delà, puisqu'il dépasse déjà "les bornes de philosopher qu'il s'était prescrites"⁽³⁾.

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(1) Entendons par là l'intuition éternelle.

(2) A.-T. V, 136.

(3) A.-T. V, 139.

III

La notion de valeurs discontinues, indépendantes les unes des autres mais perpétuellement dépendantes d'un objet transcendant, remplace la notion cartésienne d'instant sur un nouveau plan. Envisagé de la sorte, le temps passe, pour ainsi dire, le temps. Changement de perspective qui a conduit certains historiens de Descartes à la possibilité d'une ingénieuse interprétation de sa métaphysique ! Non seulement, nous ne serions plus la proie du doute ; mais replacés en Dieu, replacés dans l'évidence intuitive, il y aurait moyen de transformer perpétuellement notre existence en valeur. Nous aurions la clef du fan eux développement sur le morceau de cire même si le morceau de cire n'existait pas au dehors, il y aurait toujours l'acte instantané de la pensée pure qui saisit la cire comme étendue ; et cet acte est tout ce qu'il m'importe de maintenir. Ce serait surtout le sens de la célèbre théorie de l'action et de la lumière qui véhiculent une causalité instantanée, se dispensant tout à fait des conditions temporelles.

Nous ne voudrions pas, quant à nous, reprendre les questions délicates qui intéressent la physique cartésienne ; il est seulement à propos de déterminer le sens de la théorie de l'instantané, de savoir dans quelle mesure, elle transforme notre vue de l'existence temporelle ; dans quelle mesure surtout elle élève notre pensée à un niveau où le temps, selon la remarque de Bradley, se *transmue* en autre chose que lui.

D'abord y a-t-il une causalité instantanée, au sens d'une causalité se dispensant des conditions temporelles ? La question se pose essentiellement à propos de la cause efficiente et surtout à propos de Dieu conçu comme cause efficiente. Peut-on attribuer à Dieu la notion de cause efficiente ? Si celle-ci requiert l'existence temporelle il va sans dire que Dieu ne peut être cause efficiente de soi-même. Une contemporanéité absolue caractérise l'essence de Dieu dans son rapport avec son existence. Or, la causalité est loin

d'exclure une pareille contemporanéité, il semble qu'au contraire elle l'exige⁽¹⁾. Entre le moment où la cause s'exerce et le moment où apparaît l'effet, il ne peut y avoir d'intervalle; les deux moments coïncident absolument. Il en résulte que la causalité peut très bien s'appliquer en un sens tout au moins *éminent*, à l'activité divine par rapport à elle-même. Pourvu que nous excluons de cette activité non seulement toute notion de train ou de cours du temps, mais aussi toute notion de dépendance, nous pourrions dire proprement que Dieu est une cause efficiente; et si l'essence divine est tellement riche et tellement abondante que rien ne puisse la déterminer du dehors, l'on dira que Dieu se détermine lui-même, qu'il est *cause de soi*⁽²⁾.

Maintenant, si nous revenons à la causalité instantanée dont Descartes vient d'établir et la possibilité et la nécessité, il faudra se demander si elle peut avoir une place dans un monde qui n'existe que dans le temps. Or, remarquons bien que la causalité en question n'exclut au fond que la distinction franche et radicale de l'*avant* et de l'*après*; Descartes n'indique pas qu'en excluant cela, la causalité instantanée, entendue en un sens à préciser, exclut aussi toute temporalité. Car il ne faut nullement confondre cette notion pourtant intéressante et féconde de la causalité instantanée avec la notion d'un Dieu cause de soi; autre chose est une action simultanée à son produit parce qu'elle lui est ontologiquement identique, autre chose une action instantanée qui ne se distingue pas matériellement de son effet. Il y aurait, selon les remarques de Kant, à considérer cette dernière action non pas peut-être dans le *temps* du temps mais tout au moins dans son *ordre*. — Que l'instant de Dieu, si toutefois cette expression a un sens, n'ait rien à voir avec l'instant du temps, que l'indépendance de Dieu par rapport aux conditions temporelles ne puisse se concilier avec la causalité instantanée c'est ce qui devra être clarifié par un examen de la notion même d'instant et de son rôle.

(1) A. T. VII, 108.

(2) A. T. VII, 109.

(3) Nous dirions, en attendant que notre langage au sujet de l'instant ==

Lorsque Descartes tente de définir l'instant, soit à propos de l'action lumineuse, soit à propos du mouvement, il revient directement ou indirectement à la réalité du temps. Qu'est-ce que l'instant, au juste ? "In Brevissimo tempore et tanquam in momento" remarque-t-il. C'est le temps le plus bref ; il l'appelle aussi un point du temps mais le point minimum, c'est-à-dire la durée minima, ce minimum de durée perceptible pour l'esprit le plus attentif et dont la pointe est la plus aigüe. Tout dans l'instant est en mouvement, en passage ou si l'on aime mieux, en action ; l'instant dure à peine, mais il dure. Descartes le montre bien quand il parle du mouvement des boules qui composent le second élément ; "elles ne s'arrêtent que ce peu de temps qu'on nomme instant, parce qu'elles sont *sans cesse en action pour se mouvoir*, ce qui est cause qu'elles continuent leur mouvement sans interruption"⁽¹⁾. L'instant lui-même tend à changer, à disparaître ; il est toujours *en train* comme l'action ou comme le mouvement qui le traversent

L'examen de la lumière confirme cette position. Sans doute, qu'elle soit envisagée dans le soleil, dans les corps lumineux, ou même comme rayon qui parvient à l'oeil, la lumière n'exige pas les notions de l'avant et de l'après. Le soleil est contemporain de l'action des corps lumineux ; il ne peut être dit antérieur à cette action, sauf dans le sens purement métaphysique où l'on dirait par exemple que l'homme est antérieur à sa raison, en ce qu'il existe avant qu'il n'en use⁽²⁾. Cette action

— divin ne peut avoir aucune justesse, au lieu d'en exprimer la nature, nous serions plutôt tentés de lui appliquer ce qui ne convient qu'à nous. En effet, je remarque que je n'ai pas même la puissance de me conserver "au travers d'un seul instant", c'est à dire durant un seul instant, l'instant en question se trouve également instable, par conséquent également exposé au non-être. Au contraire, Dieu en qui se trouve une puissance telle qu'il puisse conserver une chose posée en dehors de lui, (*extra se positam*) se conserve à plus forte raison par sa propre puissance. (A.-T. VII, 111) Mais il est entendu que Dieu se conserve non seulement en dehors du temps, mais aussi en dehors du "*momentum temporis*".

(1) *Principes* III, parag. 63. C'est nous qui soulignons.

(2) A.-T. II, 209.

elle-même qu'on peut appeler dans le langage scolastique *lux* est également contemporaine de la lumière qui se trouve dans les corps transparents, c'est-à-dire dans ce qu'on pourrait appeler les effets de l'action lumineuse. Cette contemporanéité traduit au fond la continuité de l'action lumineuse, du rayon lumineux et surtout de la liqueur très subtile qui les transmet. Mais encore une fois, contemporanéité ne signifie pas intemporalité. En effet, "il y a de l'équivoque au mot instant; car il semble", dit-il à Mersenne, dans une lettre du 27 mai 1638 "que vous le considérez comme s'il niait toute sorte de priorité, en sorte que la lumière peut ici être produite sans passer, premièrement par tout l'espace qui est entre lui et nous, au lieu que le mot d'instant n'exclut que la priorité du temps et n'empêche pas que chacune des parties inférieures du rayon ne soit dépendante de toutes les supérieures, en même façon que la fin d'un mouvement successif dépend de toutes ses parties précédentes"⁽¹⁾.

La notion d'un courant continu de matière s'oppose, il est clair, à toute interprétation démocratéenne du *mot de* cartésien. C'est ce que Descartes dit à Morin, qui assimile la matière subtile à la poussière extrêmement fine qui paraît en l'air vis-à-vis d'une fente de fenêtre exposée. "Les moindres parties de cette poussière", répond Descartes "sont beaucoup plus grosses que l'air pur, et les moindres de l'air pur sont beaucoup plus grosses que celles que j'attribue à la matière subtile, laquelle, je conçois comme une liqueur continue qui remplit tous les espaces que les corps plus grossiers n'occupent point, et non pas comme étant composée de parties disjointes, ainsi que sont celles de la poussière"⁽²⁾. —

Cette notion s'oppose aussi, il est clair, à toute réduction atomique de l'instant, à toute tentative de prendre l'instant comme un morceau détaché, comme un morceau qui aurait plus de réalité que le changement universel. Une comparaison

(1) A.-T. II, 143.

(2) A.-T. II, 143.

(3) A.-T. II, 372 — 373.

des notions de mouvement et d'action serait ici éclairante. Dire de la lumière que c'est à la fois un mouvement et une action, n'a rien de contradictoire et ceci pour la simple raison que le terme d'action est suffisamment général et signifie "non seulement la puissance ou l'inclination à se mouvoir mais aussi le mouvement même" (1). Cette distinction du mouvement et de la *tendance* au mouvement est capitale. Car s'il est vrai que "le mouvement ne se fait pas en un instant, néanmoins il est évident que tout corps qui se meut est déterminé à se mouvoir" (2). C'est pourquoi, bien que plusieurs mouvements n'aient pas lieu en un seul corps au même instant, on peut et on doit soutenir qu'il peut y avoir en lui plusieurs tendances au mouvement, qu'il est en fait animé de plusieurs actions. "D'autant qu'il arrive souvent que plusieurs diverses causes agissant ensemble contre un même corps, empêchent l'effet l'une de l'autre, on peut dire selon diverses considérations que ce corps, tend ou fait effort vers divers côtés en même temps" (3).

Le mouvement tend néanmoins à se rapprocher de l'action et par quelques aspects à avoir lieu dans l'instant. Car non seulement, chacune des parties d'un mouvement d'ensemble peut être envisagée dans l'instant; mais aussi des parties distinctes d'un même mouvement peuvent se sentir en même temps dans l'une des parties d'un corps que dans l'autre; surtout que le mouvement "se transmet en un instant lorsque chacune des parties est aussitôt en un lieu que l'autre, comme lorsque deux bouts d'un bâton se meuvent ensemble" (4).

Sur cette instantanéité du mouvement ou plutôt de l'action, deux remarques doivent pourtant être faites. D'une part, il *peut* y avoir plusieurs instants contemporains, et il *doit* y avoir des instants qui se continuent les uns les autres. Dire que la lumière se passe dans l'instant, n'exclut aucunement qu'il y

(1) A.-T. II, 204.

(2) *Principes* II, parag. 39.

(3) *Principes*, III, parag. 57.

(4) Wahl, *Du Rôle de l'Idée de l'Instant dans la Philosophie cartésienne*.

ait une pluralité d'instants composant pour ainsi dire entre eux un courant temporel continu. Dès lors l'instant ne serait presque plus qu'une prise de position fluide et évanescence sur le courant temporel. D'autre part, parler de l'instant, ce n'est jamais parler de quelque chose d'achevé; Descartes, par plusieurs expressions, insiste sur ce qui est *en train de*, sur ce qui est *en voie de*, plutôt que sur ce qui est en arrêt, en repos absolu. L'instant recèle, comme nous le remarquons, l'action, c'est-à-dire, ce qui tend à être, à se mouvoir, le commencement d'un mouvement. Rien de stable, rien de mort; mais tout est en mouvement ou mieux encore en voie de mouvement, en inclination.

• • •

Pour employer une expression de Samuël Alexander, on peut dire que le mouvement est autant pris au sérieux par Descartes que le temps par Bergson. Monsieur Norman Kemp Smith remarque qu'il y a chez Descartes deux interprétations divergentes et presque contradictoires du mouvement⁽¹⁾. Tantôt le mouvement est considéré en fonction de l'étendue, comme un simple mode de l'étendue⁽²⁾; il est alors étudié géométriquement et même algébriquement. Le mouvement dans ce sens est relatif⁽³⁾. Tantôt, le mouvement est considéré comme une réalité positive, presque comme un *tertium quid* à côté de l'étendue et de la pensée. Si le changement dans le monde se ramène au mouvement local, il ne disparaît pas par là même. Dans sa réalité positive il, requiert l'intervention créatrice de Dieu, tout autant que le requièrent l'existence du moi et celle de la matière. C'est le sens qui se dégage de l'étude des lois cartésiennes du mouvement dans la deuxième partie de *Principes*.

Rien, semble-t-il, ne donne plus que ces textes, l'impression de la manière dont se lie chez Descartes la conscience de la réalité et de la nouveauté perpétuelle du changement dans le

(1) *Studies in cartesian philosophy* p. 71, 75.

(2) *Principes*, II, parag. 110.

(3) voir Bergson, *Evolution créatrice*, 373.

monde, a la notion de permanence et d'immutabilité divines⁽¹⁾. Ce continuel changement, puisqu'il est voulu par Dieu qui "a donné au mouvement de ne jamais demeurer attaché aux menues parties de la matière et de passer les unes aux autres, selon leurs diverses rencontres", "ne répugne en aucune façon à l'immutabilité qui est en Dieu, et semble même servir d'argument pour la prouver"⁽²⁾. Dieu, en créant le monde par un acte unique, le crée avec ses propriétés et ses lois. Dire que du point de vue physique, le monde a pris son aspect définitif dès l'origine, ne signifie pas qu'il soit en ce moment exactement comme il était au commencement; cela signifie simplement que la quantité de mouvement étant la même, il y aura perpétuellement une loi dans le monde qui fait que l'augmentation et la diminution se remplaçant tour à tour, produiront un effet de compensation. Parler de la stabilité initiale du monde, ce n'est pas nier que le facteur temporel compte pour le mouvement.

Les catégories appartenant irréductiblement à l'existence temporelle s'appliquent aussi bien au mouvement qu'au moi. "Ainsi nous voyons tous les jours, lorsque quelque partie de cette matière est carrée. . . qu'elle demeure toujours carrée, s'il n'arrive rien d'ailleurs qui change sa figure; et que si elle est en repos . . . elle ne commence point à se mouvoir de soi-même. Mais lorsqu'elle a commencé une fois de se mouvoir, nous n'aurons aussi aucune raison de penser qu'elle doive jamais cesser de se mouvoir de même force . . . pendant qu'elle ne rencontre rien qui retarde ou qui arrête son mouvement. De sorte que, si un corps a commencé un fois de se mouvoir, nous devons conclure qu'il continue par après de se mouvoir et que jamais il ne s'arrête de soi-même"⁽³⁾.

Si la réalité matérielle possède du point de vue de son mouvement, une histoire véritable, le monde dans son ensemble aura lui aussi son histoire. Sans doute, insistera-t-on toujours,

(1) voir Wahl *La Rôle de l'Idée de l'Instant dans la Philosophie de Descartes* pp. 42—43

(2) *Princ.* II, 42.

(3) *Princ.* II, parag. Souligné par Descartes.

cette histoire est introduite plutôt comme une hypothèse ou même comme une fiction utile, que comme une explication véritable⁽¹⁾. Il faut pourtant faire attention au langage de Descartes, au sujet de ces mêmes hypothèses : il veut bien qu'on prenne ce qu'il dit pour une hypothèse, bien qu'il paraisse tout à fait excessif de vouloir appliquer ce nom à ce qui est à la fois mathématiquement et expérimentalement établi. Il semble, "que ce serait faire injure à Dieu de croire que les causes des effets qui sont en la nature et que nous avons ainsi trouvées sont fausses; car ce serait *le vouloir rendre coupable de nous avoir créés ainsi imparfaits, que nous fussions sujets à nous méprendre, lors même que nous usons bien de la raison qu'il nous a donnée*"⁽²⁾. — En ce qui concerne des matières d'importance capitale comme la physique ou l'histoire du monde, il ne veut pas donner l'impression qu'il est trop hardi ou croit ses forces supérieures à celles des autres. C'est pourquoi, pour amener le public à son point de vue, il propose ses théories physiques plutôt comme des hypothèses que comme des vérités absolues.

Il y a pourtant une raison autrement sérieuse pour considérer l'interprétation historique du monde comme incompatible avec la théorie cartésienne de l'acte divin, comme incompatible aussi avec sa foi aveugle en la vérité de l'Écriture. La foi nous enseigne que le monde et non seulement l'homme, ont été créés dans l'état d'achèvement, dans lequel ils se trouvent en ce moment⁽³⁾. D'un autre côté, la raison nous montre que l'acte créateur, puisqu'il ne se répète pas, mais qu'il conserve une validité absolument extensive, a posé hors de soi un monde semblable en tous points à celui dans lequel nous vivons actuellement. Il en résulte que toute idée de développement, d'évolution, de changement en meilleur ou en pire, est absente du plan du monde⁽⁴⁾; il en résulte également que le temps par

(1) Wahl : p. 42.

(2) *Princ* III, parag. 43.

(3) *Princ* III, § 45.

(4) Bouillier *Histoire de la Philosophie Cartésienne* I, 91.

rapport à un monde ainsi achevé, ne pourrait avoir aucun sens⁽¹⁾. Plus peut-être que la théorie de l'instantanéité de la lumière, *le Monde* de Descartes risque d'avoir simplement une vérité d'essence, de n'avoir par conséquent rien en commun avec le moi qui existe dans le temps.

Il va de soi que sur le témoignage de l'Écriture Sainte, Descartes offre peu de réflexions approfondies. Mais le comprend-il à la lettre ? La chose est difficile à maintenir. Dans *l'Entretien avec Burman*⁽²⁾, il dit que le récit de la Genèse l'a préoccupé pendant longtemps, mais qu'il n'a pas su, quant à lui, en tirer un renseignement philosophiquement intéressant; il serait pourtant enchanté si quelqu'un pouvait lui en donner une interprétation satisfaisante. Comme il pense la chose impossible, il propose qu'on prenne ce récit dans un sens purement métaphorique. Or aucune explication métaphysique du monde ne pourrait s'appuyer sur une interprétation pareille. D'autre part, là où il semble beaucoup plus respectueux, c'est-à-dire dans les *Principes* et dans le *Discours*, son admission du récit de la Genèse ne paraît l'entraîner à aucun véritable compromis, ni même à sacrifier le point de vue proprement philosophique ou physique.

Ce qui compte, par contre, en faveur du récit de la Genèse, selon lequel apparemment le monde aurait atteint sa perfection dès sa création même, c'est la position quasi personnelle de Descartes sur la création continuée. Nous nous sommes rendus compte que cette théorie posait en principe que le monde comme le moi requièrent un acte créateur dont la validité était à la fois immédiate et infinie. Or, à partir de cette position préliminaire, nous pouvons poser une perfection, un achèvement du monde dans son ensemble et dans ses détails *in actu*; mais nous pouvons également poser un monde achevé quant à l'ensemble et non plus quant aux détails; nous pouvons finalement admettre à l'origine du monde une matière plutôt confuse et cahotique à laquelle Dieu a appliqué dès

(1) Wahl : *Du Rôle de l'idée d'instant* pp. 42 — 43.

(2) A propos des *Principes de la Philosophie* III, § 43 (avoir : Adam, 90—93)

l'origine les lois du mouvement. Or, cette dernière hypothèse est fortement présente à l'esprit de Descartes aussi bien quand il écrit les *Principes* que quand il écrit la 5ème partie du *Discours*⁽¹⁾. C'est peut-être au fond la seule qu'il prenne véritablement au sérieux; car le monde serait, quant au principe, un monde parfait si la matière était simplement créée avec les lois de son mouvement. Dès l'origine nous aurons la matière et les lois de son changement, comme de son organisation. Que veut-on de plus ? Et n'est-ce pas ce qu'aien compris Pascal quand il reprochait au Dieu de Descartes qu'il se contentât de donner au monde une chiquenaude afin de le mettre en mouvement ?

. * .

Une des nouveautés de la méthode cartésienne consiste à substituer l'ordre des raisons de connaître à l'ordre des catégories de l'être; dans l'intention profonde de Descartes, les principes d'explication ontologique sont celles-là mêmes qui nous permettent de comprendre. Or, dans la même mesure où le *cogito* nous permet de monter à Dieu et de le connaître, les lois du mouvement nous permettent de connaître le monde et dans son architecture et dans ses détails. Il est vrai qu'il y a une chance pour que ce que nous proposons ne soit pas la seule explication possible; il est vrai surtout que du point de vue de Dieu, le monde ne comporte ni histoire ni temps ni succession. "Mais il faut avouer que la nature des choses surtout matérielles" est bien plus aisée à connaître lorsqu'on les voit *naître peu à peu* en cette sorte que lorsqu'on ne les considère que *toute faites*"⁽²⁾.

Mais suis-je même obligé, même en vue d'une explication

(1) "Mais il est certain, et c'est une opinion communément reçue entre les théologiens, que l'action par laquelle maintenant il le conserve, est toute la même que celle par laquelle il l'a créé : de façon qu'encore qu'il ne lui aurait point donné au commencement d'autre forme que celle du cahos, pourvu qu'ayant établi les lois de la nature, il lui prêtât son concours pour agir ainsi qu'elle a coutume, on peut croire etc..." (*Discours*, 5ème partie; voir également *Principes* III, parag. 47).

(2) *Discours* 5ème Partie. Souligné par nous.

historique du monde de le considérer initialement dans l'état de chaos et de confusion que décrivent les poètes⁽¹⁾.? En aucune manière. En fait si Descartes, comme le remarque si bien Monsieur Wahl, a présupposé dans son traité sur *le Monde*, l'inégalité et le désordre comme étant à l'origine des choses, au contraire dans les *Principes*, il aime autant commencer avec l'ordre et l'égalité. Le détail, la structure même de l'explication ne changeront pas pour autant. Car si j'ignore dans quel état la matière se trouvait au commencement, je puis être certain que disposée comme elle était et avec les lois du mouvement que Dieu lui a appliquées dès l'origine, elle prendra par la suite, petit à petit, la forme que le monde possède actuellement. Ce qui importe, c'est de savoir que la matière "doit continuellement se changer, jusqu'à ce qu'enfin elle compose un monde entièrement semblable à celui-ci"⁽²⁾. — Il faudra ajouter qu'étant donné les lois, je dirais la réalité positive, du mouvement, une explication historique dont les modalités peuvent varier, s'impose. En effet, "les lois du mouvement étant cause que la matière doit prendre successivement toutes les formes dont elle est capable, si on considère par ordre toutes les formes, on pourra enfin parvenir à celle qui se trouve à présent en ce monde"⁽³⁾. Regarder, en, effet le monde du point de vue concret et non plus du point de vue géométrique, c'est le considérer précisément du point de vue de ses *raisons de connaître*, c'est-à-dire des hypothèses de sa formation.

* * *

CONCLUSION.

Inutile pour l'instant d'entrer dans les détails des explications cartésiennes. Il y aurait tout un travail à faire sur le

(1) *Princip.* III, § 47.

(2) *Princ.* III, parag. 47.

(3) *Ibid.*

rôle qu'à joué Descartes dans la formation des diverses théories cosmogoniques jusqu'à Kant. Ce qui importe, c'est de reconnaître que lorsque le monde est envisagé par lui, son aspect dynamique, temporel et historique n'est pas instant perdu de vue. On pourrait peut-être prendre au sérieux la boutade de Descartes dans la première partie du *Discours*, contre l'histoire et les livres historiques. Mais si l'on persiste à vouloir placer Descartes dans un courant d'idées qui s'oppose au progrès et à la formation des choses, on risque de ne comprendre ni Descartes lui-même ni l'histoire du cartésianisme. Sans tenir compte du cas de Pascal dont l'orientation philosophique est assez différente, l'on ne peut négliger l'utilisation que fait un Fontenelle, par exemple, des positions cartésiennes, aussi bien du *Discours*, que des *Principes*; même la primauté que donne Pierre Bayle à la certitude historique ne peut être étrangère à l'esprit cartésien. Car, une fois nourri de l'évidence géométrique, on peut, on doit même d'après les conseils de Descartes, délaissier la métaphysique et les mathématiques, pour descendre vers les choses concrètes. Or, toute tentative, pour interpréter la structure du concret, doit tenir compte de l'élément temporel.

On comprend donc que Bergson, à la fin de l'*Evolution Créatrice*, voulant marquer la part de responsabilité qui incombe à Descartes dans la formation de la pensée moderne, ne manque pas de signaler les éléments historiques de sa conception du monde. Par le rôle qu'il donne au temps, par la manière dont il conçoit le mouvement, Descartes n'est certes pas étranger à une vue à la fois historique et dramatique du monde.

Il faut pourtant noter la nuance qui se laisse entrevoir chez lui entre l'explication hypothético-déductive de la formation du monde, et l'explication ou encore mieux la description phénoménologique de la durée. Bien que la première comporte un coefficient temporel indéniable, il arrive un moment où l'on passe du plan de l'histoire à celui de la déduction.

Pour le devenir de la conscience, il ne peut en être de même. Car si la matière passe successivement par différents états, le moi prend conscience du *passage de l'être*, en lui et dans les choses. Or, cette conscience ne peut être génératrice d'espoir, je dirais même de salut, que dans la mesure où elle est une exigence de transcendance. Et, de là, on saisit clairement que l'élan personnel qui porte Descartes vers Dieu ne procède pas simplement d'une généralisation concrète de la durée, mais plutôt d'une réflexion précise sur le caractère contingent de l'existence du moi. De là, on saisit également la divergence profonde qui sépare la conception du temps comme devenir créateur, comme immanence ou pénétration créatrice et la conception cartésienne selon laquelle le temps m'indique perpétuellement les risques et les surprises du néant.

N. Baladi